APPENDIX A
FRONTIER GEOSCIENCES FMSS
TEST METHOD DESCRIPTION
COMPARISON OF CVAAS AND CVAFS ANALYSIS

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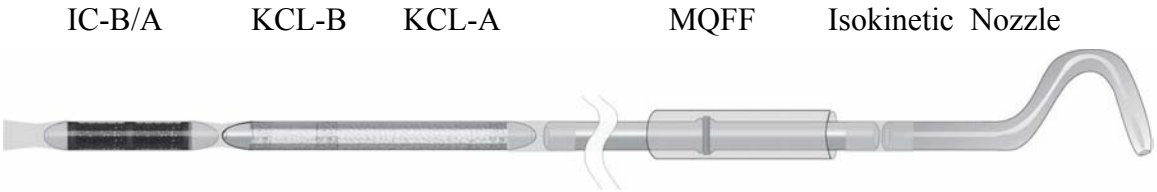
FLUEGAS MERCURY SORBENT SPECIATION (FMSS) METHOD

The FMSS method relies on sequential selective capture to separate and quantify three mercury species, particulate Hg (PHg), gaseous oxidized ($Hg(II)_g$), and gaseous elemental (Hg^0). A known, precise volume (±0.1 liter) of gas is pulled through the FMSS sorbent train using standard sampling equipment including a quartz probe liner, heated probe, silica-gel water trap, mass flow meter and pump (FGS MFM Fluegas SOP). The FMSS method is setup to sample semi-isokinetically to more accurately quantify PHg using a buttonhook nozzle directed into the vent gas flow. The PHg is captured on a quartz-fiber filter with the gas phase Hg(II) and Hg^0 passing through to be captured on a potassium chloride (KCl) coated quartz sorbent trap and finally the iodinated (IC) sorbent trap, respectively. The temperature of the FMSS sorbent train is kept at 95 ± 5 °C during sampling to avoid water condensation in the trap. The water in the vent gas condenses in a silica gel water-trap behind the FMSS sorbent train. The water can be quantified by weight difference to provide a backup value for percent water and also to calculate wet sample volume as needed for select vents. The sorbed Hg^0 on iodinated carbon and the PHg on the quartz filter is leached of collected Hg in the clean lab using hot-refluxing HNO_3/H_2SO_4, then further oxidation in BrCl solution (FGS SOP-009.3). The sorbed Hg (II) on the KCl-quartz trap is dissolved in (v/v) BrCl solution (FGS SOP-031.2). Aliquots of all three Hg species digests are analyzed using cold vapor atomic fluorescence spectroscopy (CVAFS) following the analytical principles of EPA Method 1631 (FGS SOP-069.2). The FMSS and precursor method have been widely used for both speciated Hg in flue gas matrices (Bloom, 1993; Bloom et al., 1995; Prestbo and Bloom, 1995; Nott, 1995; Laudal et al., 1997; Grover et al., 1999). The FMSS method has recently undergone rigorous validation experiments in coal flue gas against the ASTM promulgated Ontario-Hydro Method (DOE-NETL, 2001; EERC, 2001). Quality assurance of the method usually includes field duplicates, field blanks, trip blanks, lab reagent blanks, 5-point calibration curve, continuing calibration verification, duplicate analyses, analytical spike recoveries, initial calibration blanks, continuing calibration blanks and standard reference material recovery.

Figure A-1. Schematic of the FMSS Method sample train.



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Bloom, N.S. (1993) "Mercury Speciation in Flue Gases: Overcoming the Analytical Difficulties." ***Managing Hazardous Air Pollutants: State of the Art.*** **(W. Chow and K. Connor, Eds.), EPRI TR-10189, Lewis Publishers, Boca Raton, USA p. 148.**

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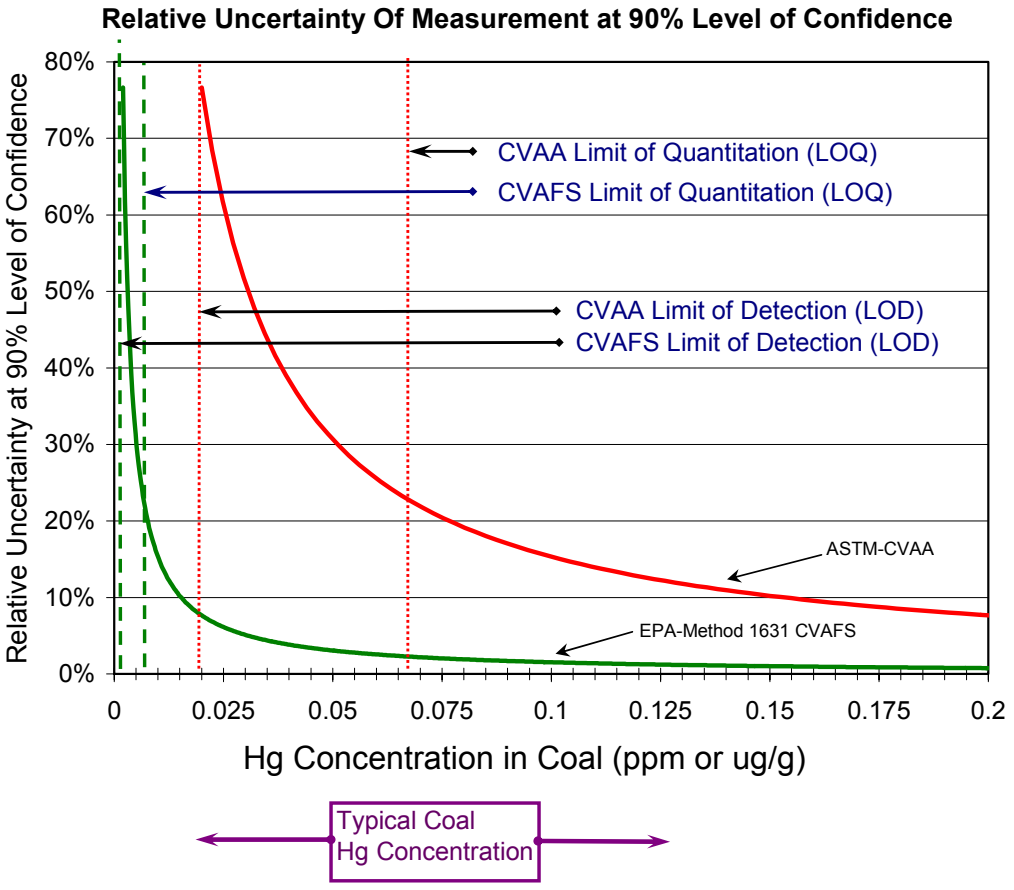
Grover C., J. Butz, S. Haythornthwaite, J. Smith M. Fox, T. Hunt, R. Chang, T. D. Brown and E. Prestbo, (1999) "Mercury Measurements Across Particulate Collectors of PSCO Coal-Fired Utility Boilers," *Proceedings of the Utility Mega Conference,* Atlanta

Laudal D.L., Heidt M.K., Brown T.D., Nott B.R. and Prestbo E.M. (1996) *Mercury Speciation: A Comparison Between EPA Method 29 and Other Sampling Methods,* proceedings of the Air & Waste Mngmt Assoc. Annual Meeting, #96-WA64A.04.

Figure A-2. Comparison of coal analyses by CVAA and CVAFS. Provided by Frontier Geosciences.

Comparison of CVAA (ASTM) and CVAFS (EPA-1631) Methods for Coal Hg
(Why should I pay more for a method with a lower detection limit?)

Example using figure below:
1) Assume your mean coal [Hg] is 0.04 ppm and number of analyses/quarter is 10.
2) The results below only include the method uncertainty - natural coal variability will **increase** the 90% confidence interval calculated below - this is a best case scenario!
3) For the CVAA method the relative uncertainty at 0.04 ppm is 38% (from upper curve) or 0.019 ppm
4) For the CVAFS method the relative uncertainty at 0.04 ppm is 3.8% (from lower curve) or 0.0019 ppm
5) Now calculate the 90% confidence interval to see if it is within 10% of the mean?
6) For CVAA, the 90% confidence interval would be 0.012 ppm or 30% of the mean - answer **NO**
7) For CVAFS, the 90% confidence interval would be 0.0012 ppm or 3% of the mean - answer **YES**
Conclusion: The only chance to keep sampling frequency at a minimum is to use a proven method to stay within EPA set level of 10% (now 30%) of the mean at 90% confidence interval - or - a more expensive per sample method may cost less overall if it decreases the number of samples required. The EPA-1631 CVAFS method will give more accurate and precise coal Hg concentration than the ASTM CVAA method.



APPENDIX B
ADA-ES MERCURY SEMI-CONTINUOUS EMISSIONS MONITOR
TEST METHOD DESCRIPTION

Mercury S-CEM

A semi-continuous mercury analyzer will be used during this program to provide near real-time feedback during baseline, parametric and long-term testing. Continuous measurement of mercury at the inlet and outlet of the particulate collector is considered a critical component of a field mercury control program where mercury levels fluctuate with boiler operation (temperature, load, etc.) and decisions must be made concerning parameters such as sorbent feed rate and cooling. The analyzers that will be used for this program consist of a commercially available cold vapor atomic absorption spectrometer (CVAAS) coupled with a gold amalgamation system (Au-CVAAS). Radian developed this type of system for EPRI (Carey, et al., 1998). A sketch of the system is shown in the figure below. One analyzer will be placed at the inlet of the particulate collector and one at the outlet of the particulate collector during this test program.

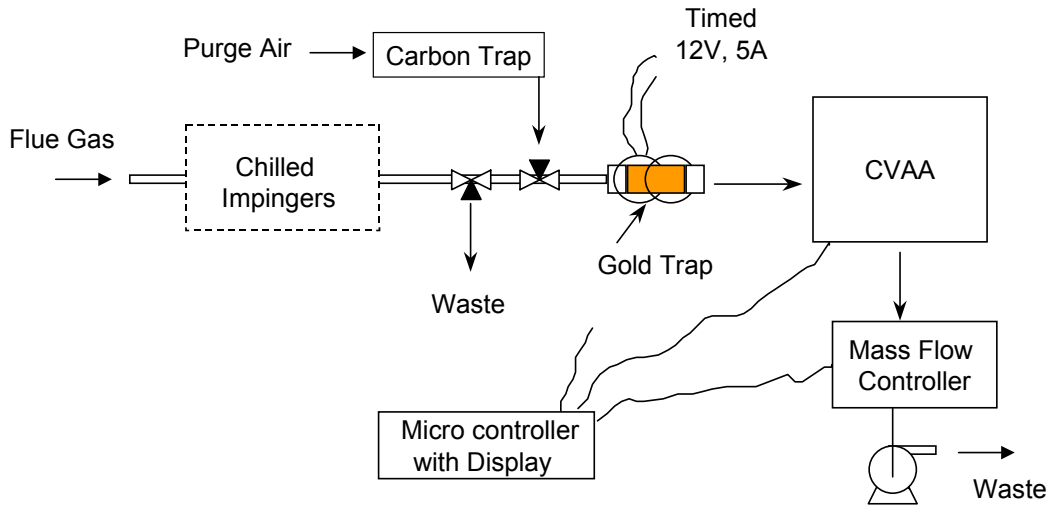


Figure C-1
Sketch of Mercury Measurement System

Although it is very difficult to transport non-elemental mercury in sampling lines, elemental mercury can be transported without significant problems. Since the Au-CVAAS measures mercury by using the distinct lines of UV absorption characteristic of elemental Hg (Hg^0), the non-elemental fraction is either converted to elemental mercury (for total mercury measurement) or removed (for measurement of the elemental fraction) near the sample extraction point. This minimizes any losses due to the sampling system.

For total vapor-phase mercury measurements, all non-elemental vapor-phase mercury in the flue gas must be converted to elemental mercury. A reduction solution of stannous chloride in hydrochloric acid is used to convert Hg^{2+} to Hg^0. The solution is mixed as prescribed in the draft Ontario Hydro Method for manual mercury measurements.

To measure speciated mercury, an impinger of potassium chloride (KCl) solution mixed as prescribed by the draft Ontario Hydro Method is placed upstream of the stannous chloride solution to capture oxidized mercury. Unique to this instrument is the ability to continuously refresh the impinger solutions to assure continuous exposure of the gas to active chemicals.

The Au-CVAAS system is calibrated using elemental mercury vapor. The instrument is calibrated by injecting a metered volume of mercury-laden air into the analyzer. The mercury-laden air is from the air-space of a vial containing liquid mercury at a precisely measured temperature. The concentration of the mercury in the air is determined by the vapor pressure of the mercury at that temperature.

The Au-CVAAS can measure mercury over a wide range of concentrations. Since the detection limit of the analyzer is a function of the quantity of mercury on the gold wire and not concentration in the gas, the sampling time can be adjusted for different situations. Laboratory tests with stable permeation tube mercury sources and standard mercury solutions indicate that the noise level for this analyzer is 0.2 ng mercury. It is reasonable to sample at 50 – 100 times the noise level, therefore, during field testing the sampling time is set so at least 10 ng mercury is collected on the wire before desorption. The following table shows the sampling time required for different concentrations of mercury in the flue gas with 2 liters per minute sample flow.

Sampling Time Required for Au-CVAA Analyzer

VAPOR-PHASE MERCURY CONCENTRATION ($\mu G/M^3$)	MINIMUM SAMPLE TIME (MIN)	NOISE LEVEL ($\mu G/M^3$)
5	1	0.1
2.5	2	0.05
1	5	0.02
0.5	10	0.01

An oxygen analyzer will be placed downstream of the Au-CVAAS to monitor and store the oxygen levels in the gas stream. This is particularly useful when measuring changes in mercury across a pollution control device on a full-scale unit where air inleakage into the unit may dilute the gas sample and bias results. It is also useful to assure that no leaks develop in the sampling system over time.

Particulate is separated from the gas sample using a self-cleaning filter arrangement modified for use with this mercury analyzer under an EPRI mercury control program. This arrangement uses an annular filter arrangement where excess sample flow continuously scours particulate from the filter so as to minimize any mercury removal or conversion due to the presence of particulate.

The mercury analyzer described has been used extensively for lab testing and field testing at three full-scale coal-fired power plants burning Powder River Basin (PRB), eastern bituminous, and lignite coals under EPRI programs. Although draft Ontario Hydro mercury measurements were not conducted while the analyzer was on-site, levels measured by the analyzer were well within the range expected based on previous measurements with either the draft Ontario Hydro Method or a solid carbon trap.

In order to assure the quality of the data to be obtained during the field operations, Standard Operating Procedures have been developed and will be followed for these tests.

APPENDIX C

UNIT OPERATING DATA:

SUMMARIES

C.1 BRANDON SHORES

C.2 CRANE STATION

C.3 WAGNER STATION

Unit Data Campaign One

								Stack CEM measurements					
Date	Site	Unit	Test #	Time	Load, MW	Opacity	Boiler O2	CO2, %	SO2, ppm	SO2, lb/MM	Nox, ppm	Nox, lb/MM	Heat input
4/14/2003	H.A. Wagner	2	Run 1	1220-1432	131	3.05	3.9	10.9	492	1.35	297	0.59	1405
4/15/2003	H.A. Wagner	2	Run 2	0815-1027	130	3.29	3.9	10.8	478	1.33	292	0.58	1405
4/15/2003	H.A. Wagner	2	Run 3	1125-1342	131	2.75	3.7	10.9	488	1.33	292	0.58	1418
4/16/2003	H.A. Wagner	3	Run 1	0840-1100	350	6.1	2.0	13.4	570	1.25	200	0.32	3220
4/16/2003	H.A. Wagner	3	Run 2	1235-1453	340	6.48		13.4	530	1.19	206	0.33	3160
4/16/2003	H.A. Wagner	3	Run 3	1618-1835	340	6.42	2.5	13.4	530	1.19	210	0.34	3160
4/17/2003	Brandon Shores	2	Run 1	1440-1705	682	3	3.5	11.9	433	1.09	291	0.53	5866
4/17/2003	Brandon Shores	2	Run 2	1800-2015	675	4	3.6	11.9	433	1.09	291	0.53	5866
4/18/2003	Brandon Shores	2	Run 3	1125-1335	668	2.8	3.7	11.85	424	1.07	281	0.51	5703
4/22/2003	Brandon Shores	1	Run 1	935-1215	631	5.02	3.8	11.55	410	1.06	237	0.44	5008
4/22/2003	Brandon Shores	1	Run 2	1310-1536	631	5.95	3.6	11.55	410	1.06	237	0.44	5008
4/22/2003	Brandon Shores	1	Run 3	1615-1831	632	6.06	3.4	11.55	410	1.06	237	0.44	5008
4/23/2003	Crane	1	Run 1	1225-1446	200	5.71	3.0	12.9	1119	2.4	267	0.443	1978
4/23/2003	Crane	1	Run 2	1555-1815	200	4.75	2.8	12.9	1119	2.4	267	0.443	1978
4/24/2003	Crane	1	Run 3	0850-1106	200	5.42	2.5	13.3	1229	2.56	259	0.418	1988
4/24/2003	Crane	2	Run 1	1513-1725	206	7.18	2.9	13	1178	2.53	933	1.55	1935
4/25/2003	Crane	2	Run 2	0710-0931	205	6.1	2.6	12.8	1236	2.69	905	1.53	1939
4/25/2003	Crane	2	Run 3	1025-1243	205	6.26	2.5	12.8	1236	2.69	905	1.53	1939

Campaign Two

						Stack CEM measurements				
Date	Site	Unit	Test #	Time	Load, MW	Opacity	CO2, %	SO2, ppm	Nox, ppm	Nox, lb/MMBtu
9/17/2003	Brandon Shores	1	Runs 1, 2, 3	0800-1700	674	9.53	11.8	416	90	0.16
9/17 - 18/03	Brandon Shores	1	Run 4	1930-0652	variable: 557 avg	6.49	11.08	378	83	0.161
9/21/2003	Brandon Shores	1	Run 5	0725-1606	variable: 423 avg	~ 2	9.33	318	87	0.199
9/21 - 26/03	Brandon Shores	1	Run 6	1756-1110	variable: 512 avg	5.89	10.03	343	69	0.15
9/30 -10/1/03	Brandon Shores	1	Run 7	1117-0744	variable: 511 avg	5.11	10.57	356	68	0.146
10/2 - 10/3/03	Brandon Shores	1	Run 8	1149-0834	variable: 316 avg	4.94	9.11	316	176	0.416
10/3/2003	Brandon Shores	1	Run 9	0919-1018	678	7.5	11.55	416	235	0.435
10/3/2003	Brandon Shores	1	Run 10	1102-1153	variable: 540 avg	4.6	10.62	374	214	0.435
9/21/2003	Brandon Shores	2	Runs 1, 2, 3	0800-1700	variable: 510 avg	4.43	10.98	390	76	0.15
9/19/2003	HA Wagner	3	Low Load	1600-1159	140	1.36	9.5	434	32	0.072
9/20/2003	HA Wagner	3	High Load	0900-1900	variable: 269 avg	1.56	11.5	526	57	0.108

APPENDIX C.1

BRANDON SHORES DATA

CAMPAIGN TWO

BS 1 RUN 1

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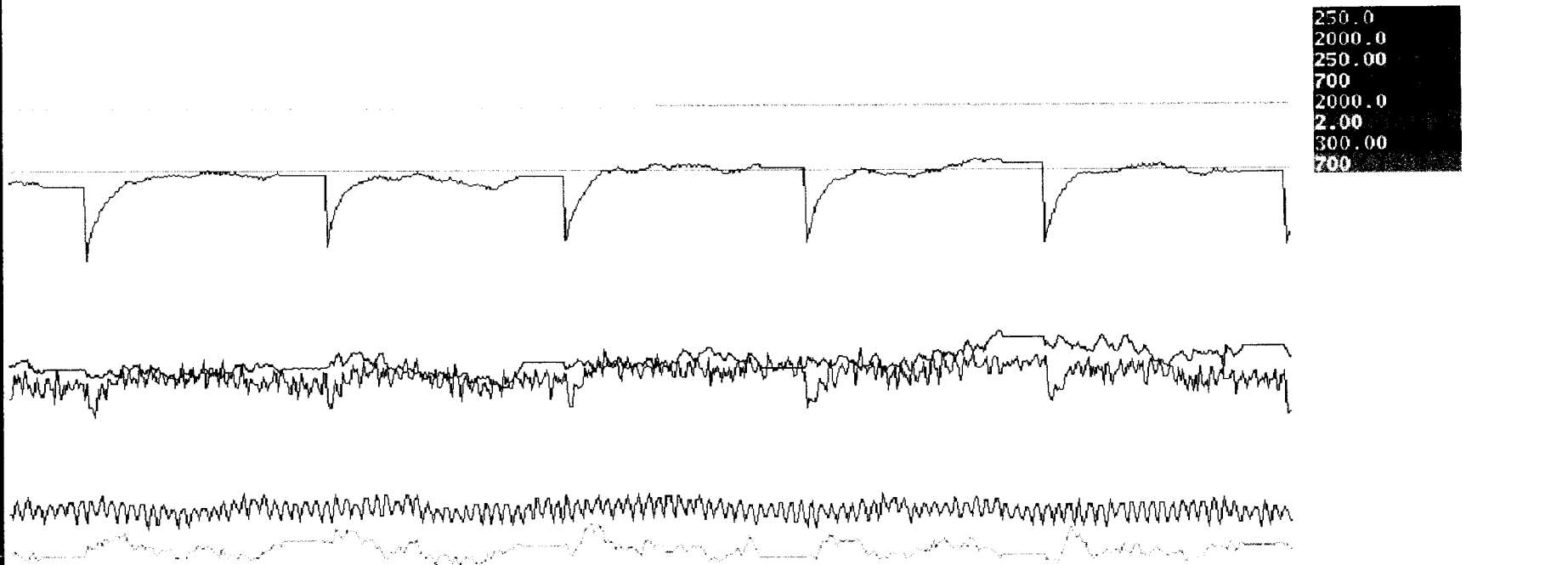
A	0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	AI9006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A	0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A	U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A	AI9004A	SCR 11 INLET TEMP AVG	DEGF	ACTUAL VAL



1 Tick = 16.0 Minutes

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DATA AN AN MA | Brandon | PROCESS | PROCESS | 17-Sep-2003 15:56:48 drop200

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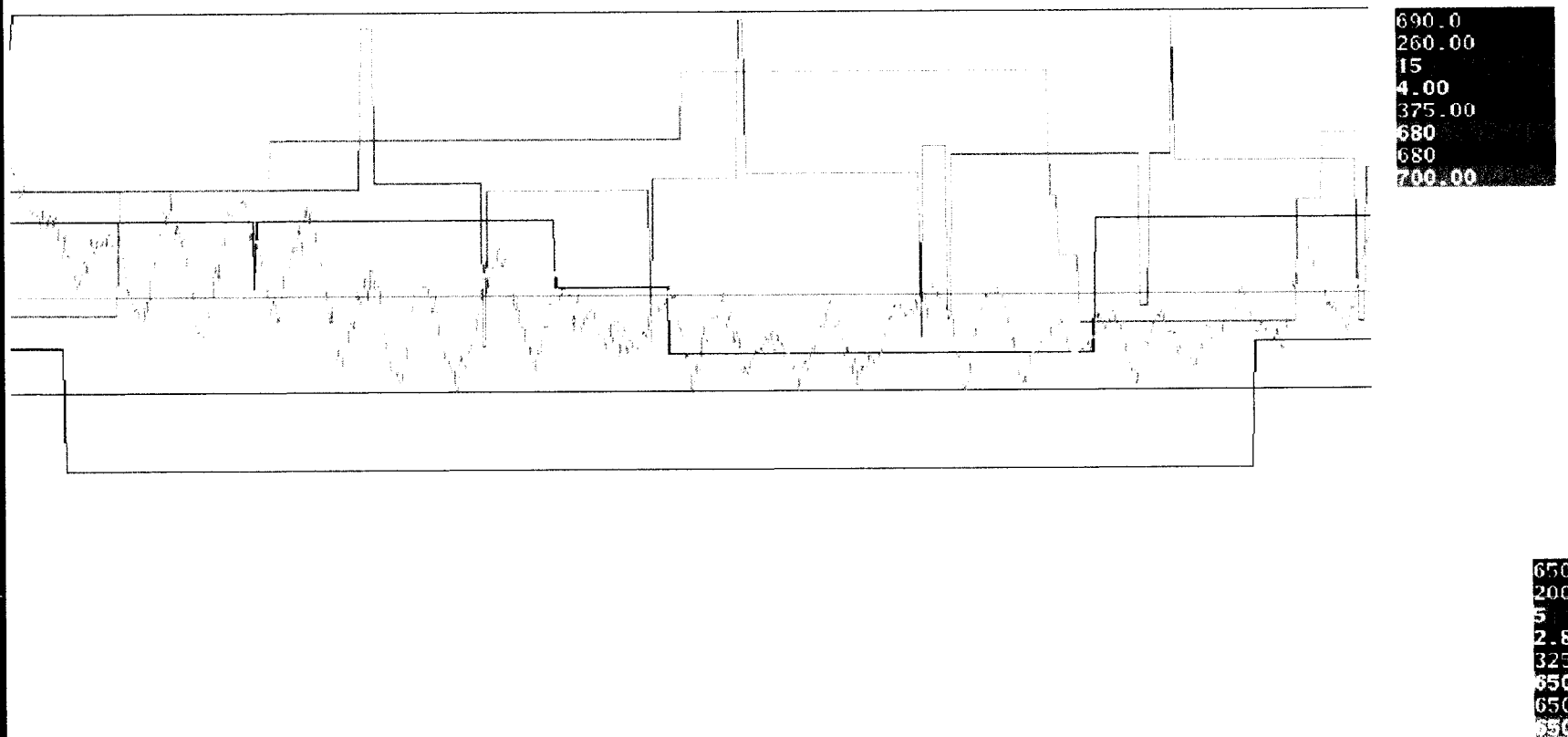
A	U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A	U1AM00FX	AIR-FUEL RATIO	LB\LB	ACTUAL VAL
A	U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A	U1AT06NX	GAS TEMP TO STACK AVG	DEGF	ACTUAL VAL
A	U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A	U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
A	U1GL02DA	GENERATOR LOAD	MW	ACTUAL VAL



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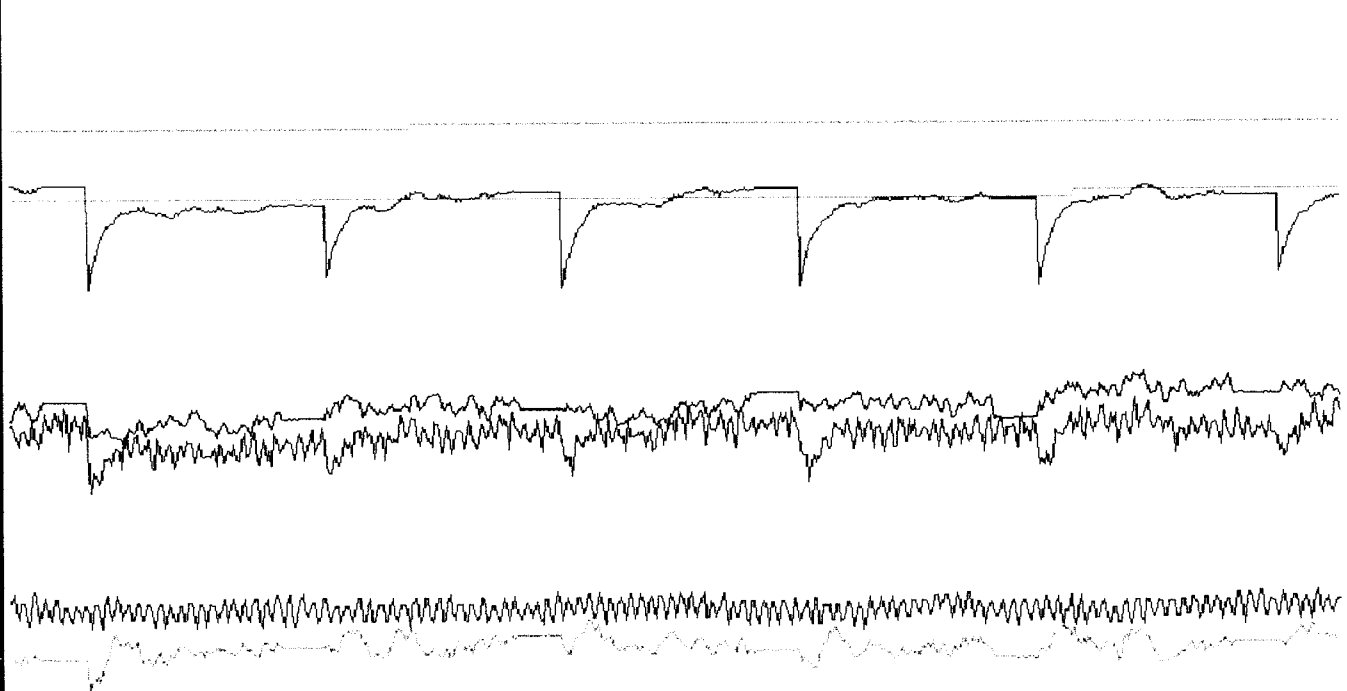
A 0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL	VAL
A U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL	VAL
A A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL	VAL
A 0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL	VAL
A U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL	VAL
A U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL	VAL
A A19004A	SCR 11 INLET TEMP AVG	DEGF	ACTUAL	VAL



1 Tick = 19.0 Minutes

Retrieval is complete - Partial data in specified time range

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DATA ANALYSIS

Historical Trend Display 2 : Modify

Historical Trend Display 2

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A	U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A	U1AM00FX	AIR-FUEL RATIO	LB\LB	ACTUAL VAL
A	U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A	U1AT06NX	GAS TEMP TO STACK AVG	DEGF	ACTUAL VAL
A	U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A	U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
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SCALE

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375.00
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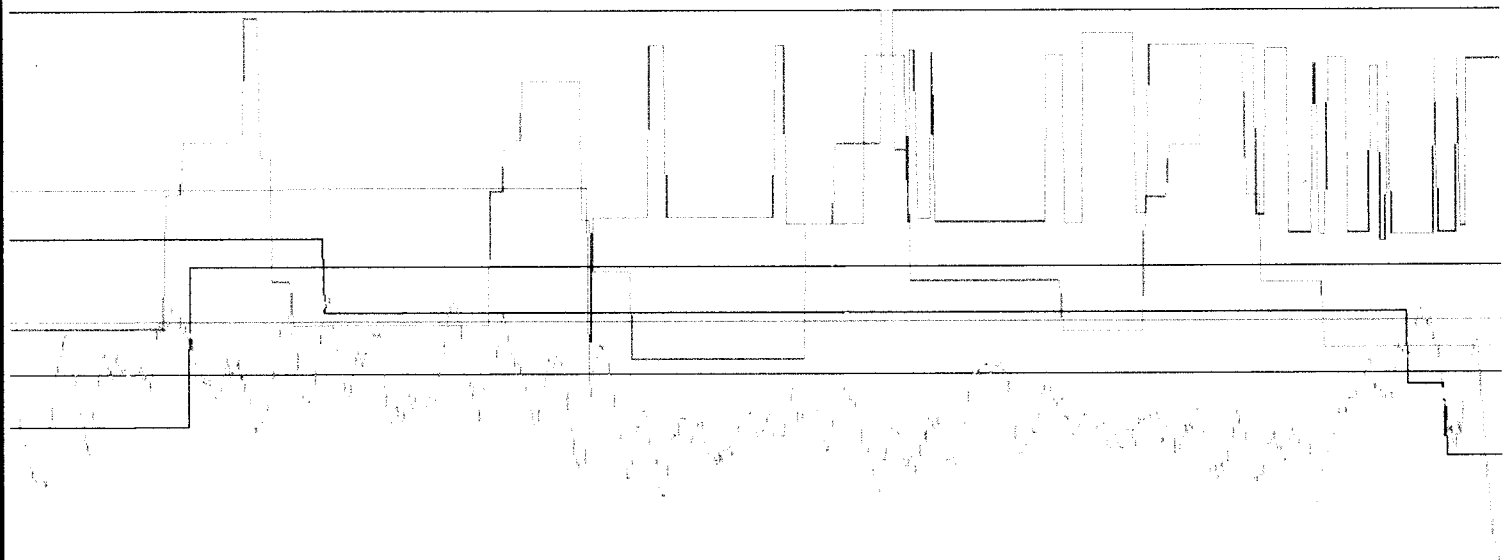
680
700.00



MIN

650.0
200.00
5
2.80
325.00
650
650
650.00

1 Tick = 22.0 Minutes

Retrieval is complete

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Brandon PROCESS

18-Sep-2003
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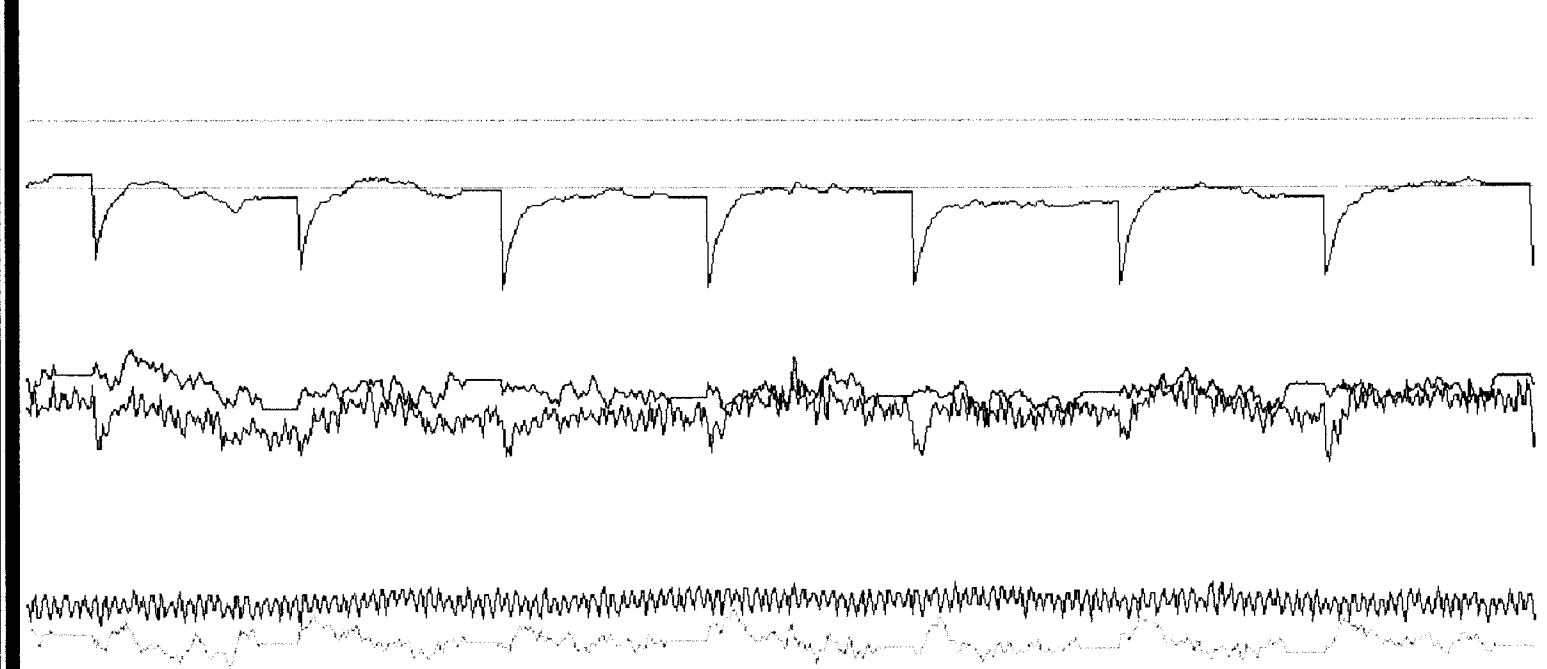
A	0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A	0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A	U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A	A19004A	SCR 11 INLET TEMP AVG	DEGF	ACTUAL VAL



1 Tick = 22.0 Minutes

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A U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A U1AM00FX	AIR-FUEL RATIO	LB\LB	ACTUAL VAL
A U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A U1AT06NX	GAS TEMP TO STACK AVG	DEGF	ACTUAL VAL
A U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
A U1GF02DA	GENERATOR LOAD	MW	ACTUAL VAL

690.0
260.00
15
4.00
375.00
680
680
700.00

650.0
200.00
5
2.80
325.00
650
650
350.00

1 Tick = 22.0 Minutes

Retrieval is complete

BS 1 RUN 4

DATA ANALYSIS AND MA | Brandon Shores U1 CHEM DAS | CUSTOM GRAPHIC | info | [redacted] | PROCESS DIAGRAM | 18-Sep-2003 07:56:18 drop200

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						①	②
A	0012X067	TOTAL MEGAWATTS(TO LDC)	MW	ACTUAL	VAL	663.9	337.3
A	U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL	VAL	265.1	136.86
A	U1AM00FX	AIR-FUEL RATIO	LB\LB	ACTUAL	VAL	11	11
A	U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL	VAL	3.86	7.41
A	U1AT06NX	GAS TEMP TO STACK AVG	DEGF	ACTUAL	VAL	360.77	330.51
A	U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL	VAL	668	628
A	U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL	VAL	668	607
A	U1GL02DA	GENERATOR LOAD	MW	ACTUAL	VAL	666.5	337.02

690.0
300.00
15
12.00
375.00
680
680
700.00

320°F

250.0
100.00
5
2.80
250.00
545
545
750.00

① ②

1 Tick = 1.3 Hours

Retrieval is complete

BS 1 RUN 4

Brandon PROCESS

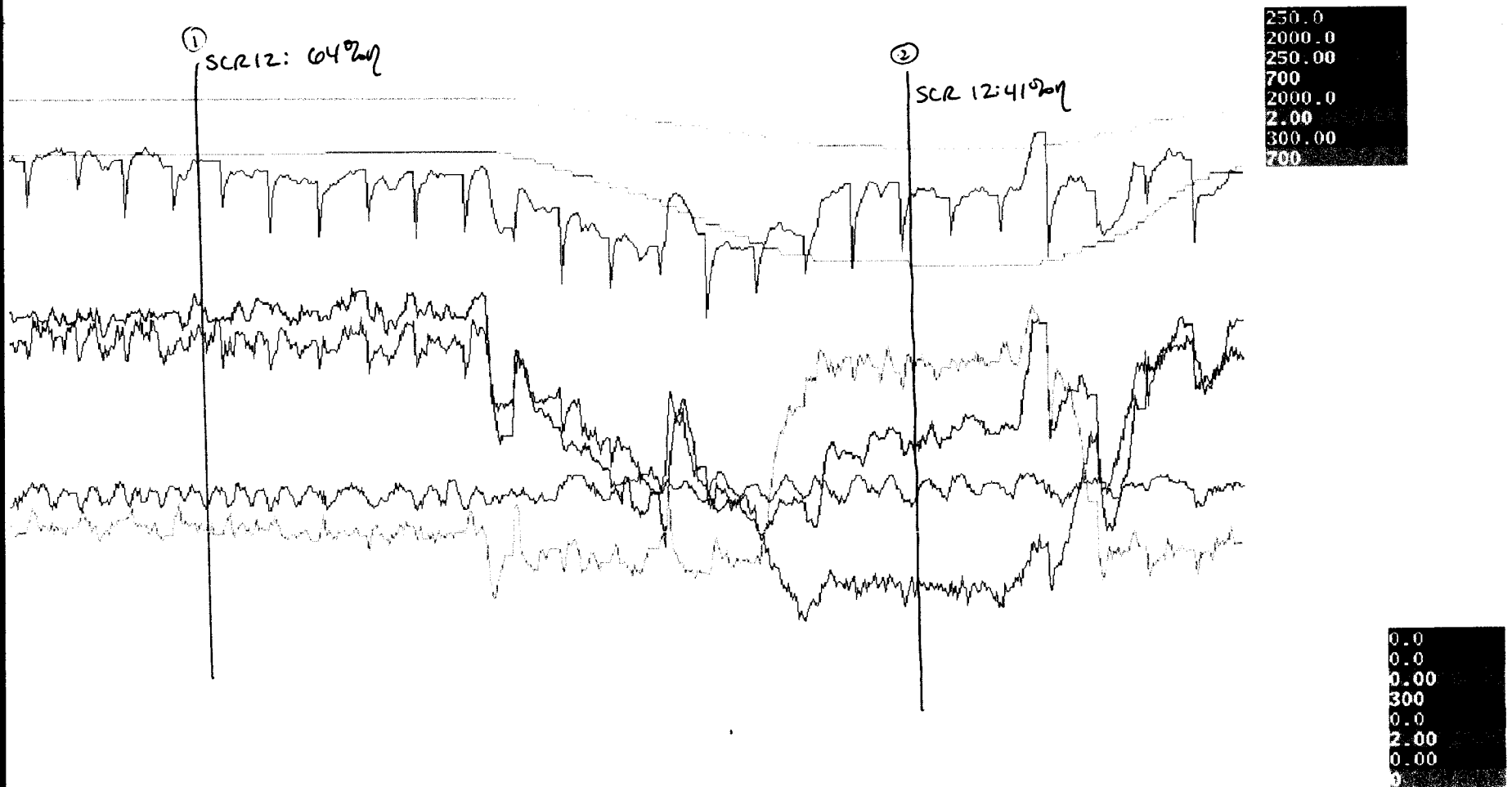
18-Sep-2003
07:52:28
drop200

Historical Trend Display 1

Select ✓ Abort Status Modify... Groups... Create new... Tabular Page Zoom Shift

Start Time: 17-Sep-03 19:00:00 EDT End Time: 18-Sep-03 07:38:44 EDT Period: 00:01:16

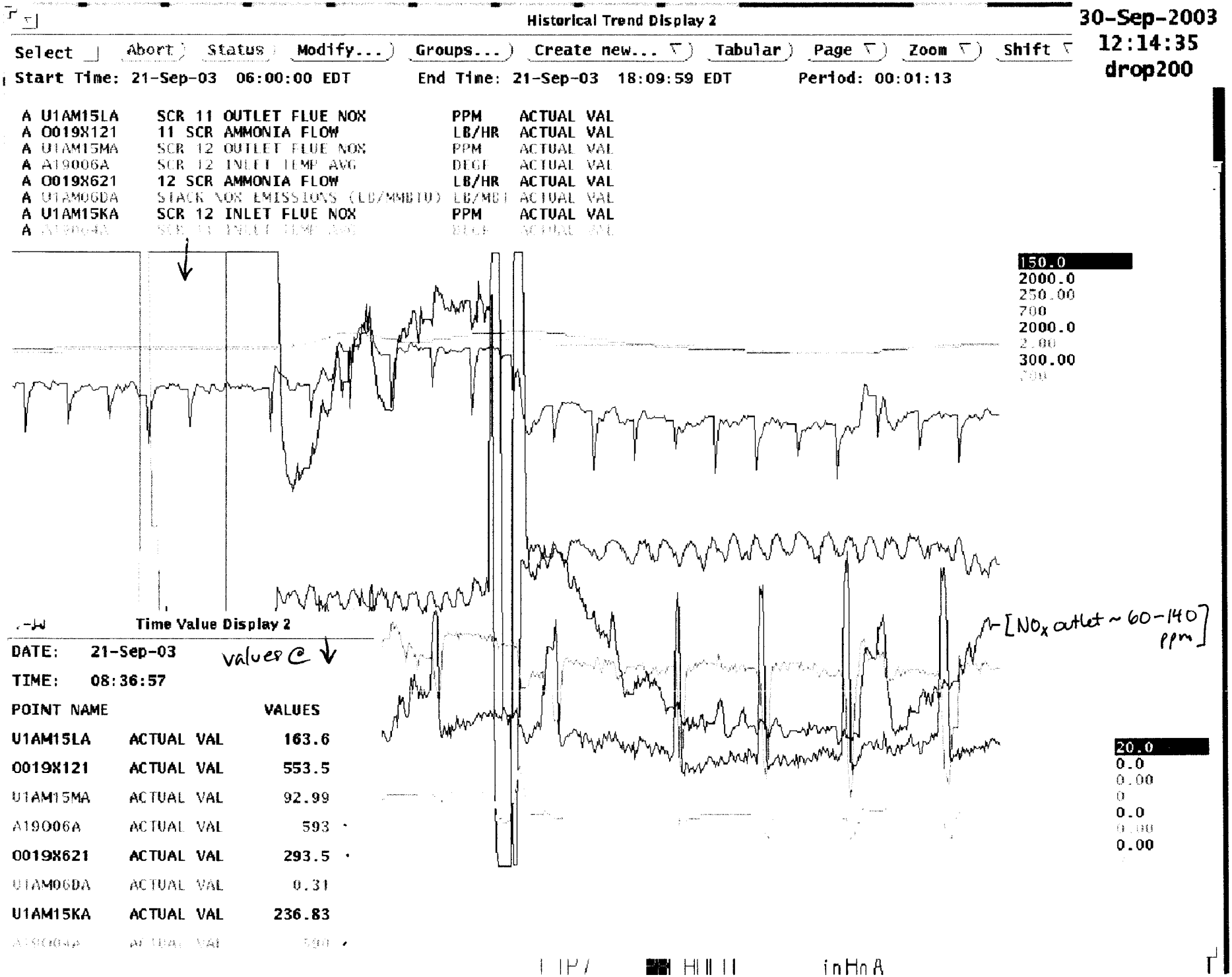
					①	②
A U1AM15LA	SCR 11 OUTLET FLUE NOX	PPM	ACTUAL	VAL	154.4	108.9
A 0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL	VAL	773.2	736.0
A U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL	VAL	85.82	134.49
A A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL	VAL	626	568
A 0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL	VAL	1173.6	499.8
A U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL	VAL	0.17	0.21
A U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL	VAL	238.84	227.31
A A19004A	SCR 11 INLET TEMP AVG	DEGF	ACTUAL	VAL	621	574



1 Tick = 1.3 Hours

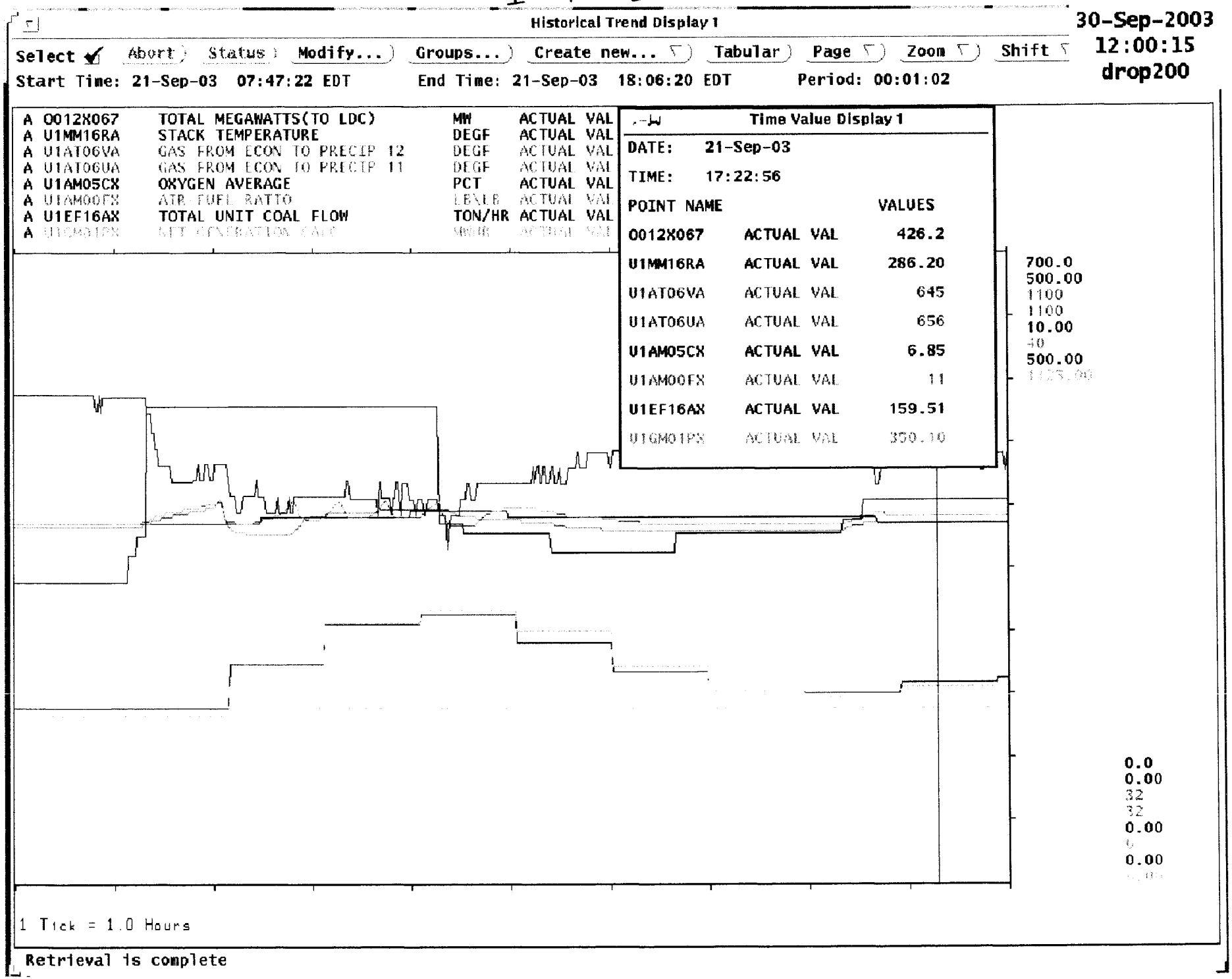
Retrieval is complete

BS1 RUN 5



[NO_x outlet ~ 60-140 ppm]

BS1 RUNS


Historical Trend Display 1
30-Sep-2003
12:00:15
drop200
Select
Abort
Status
Modify...
Groups...
Create new...
Tabular
Page
Zoom
Shift
Start Time: 21-Sep-03 07:47:22 EDT
End Time: 21-Sep-03 18:06:20 EDT
Period: 00:01:02
A 0012X067 TOTAL MEGAWATTS(TO LDC) MW ACTUAL VAL
A U1MM16RA STACK TEMPERATURE DEGF ACTUAL VAL
A U1AT06VA GAS FROM ECON TO PRECIP 12 DEGF ACTUAL VAL
A U1AT06UA GAS FROM ECON TO PRECIP 11 DEGF ACTUAL VAL
A U1AM05CX OXYGEN AVERAGE PCT ACTUAL VAL
A U1AM00FX AIR FUEL RATIO LB\LB ACTUAL VAL
A U1EF16AX TOTAL UNIT COAL FLOW TON/HR ACTUAL VAL
A U1GM01PX NET GENERATION GAIC MWHR ACTUAL VAL
Time Value Display 1
DATE: 21-Sep-03
TIME: 17:22:56
POINT NAME VALUES
0012X067 ACTUAL VAL 426.2
U1MM16RA ACTUAL VAL 286.20
U1AT06VA ACTUAL VAL 645
U1AT06UA ACTUAL VAL 656
U1AM05CX ACTUAL VAL 6.85
U1AM00FX ACTUAL VAL 11
U1EF16AX ACTUAL VAL 159.51
U1GM01PX ACTUAL VAL 350.10
700.0
500.00
1100
1100
10.00
40
500.00
0.0
0.00
32
32
0.00
0.00
1 Tick = 1.0 Hours
Retrieval is complete

BS1 RUN 5

Historical Trend Display 2

Select | Abort | Status | Modify... | Groups... | Create new... | Tabular | Page

Start Time: 21-Sep-03 06:00:00 EDT End Time: 21-Sep-03 18:09:59 EDT Period: 0

A U1AM15LA	SCR 11 OUTLET FLUE NOX	PPM	ACTUAL VAL
A 0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A 0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A [illegible]	[illegible]	[illegible]	[illegible]

Time 30-Sep-2003
DATE: 21-Sep-03 12:14:52
TIME: 08:36:57 drop200

POINT NAME		VALUES
U1AM15LA	ACTUAL VAL	163.6
0019X121	ACTUAL VAL	553.5
U1AM15MA	ACTUAL VAL	92.99
A19006A	ACTUAL VAL	593
0019X621	ACTUAL VAL	293.5
U1AM06DA	ACTUAL VAL	0.31
U1AM15KA	ACTUAL VAL	236.83
A19006A	ACTUAL VAL	590

700

20.0
0.0
0.00
0
0.0
0.00

1 Tick = 1.2 Hours

Retrieval is complete

inHnA

BS 1 RUN 5

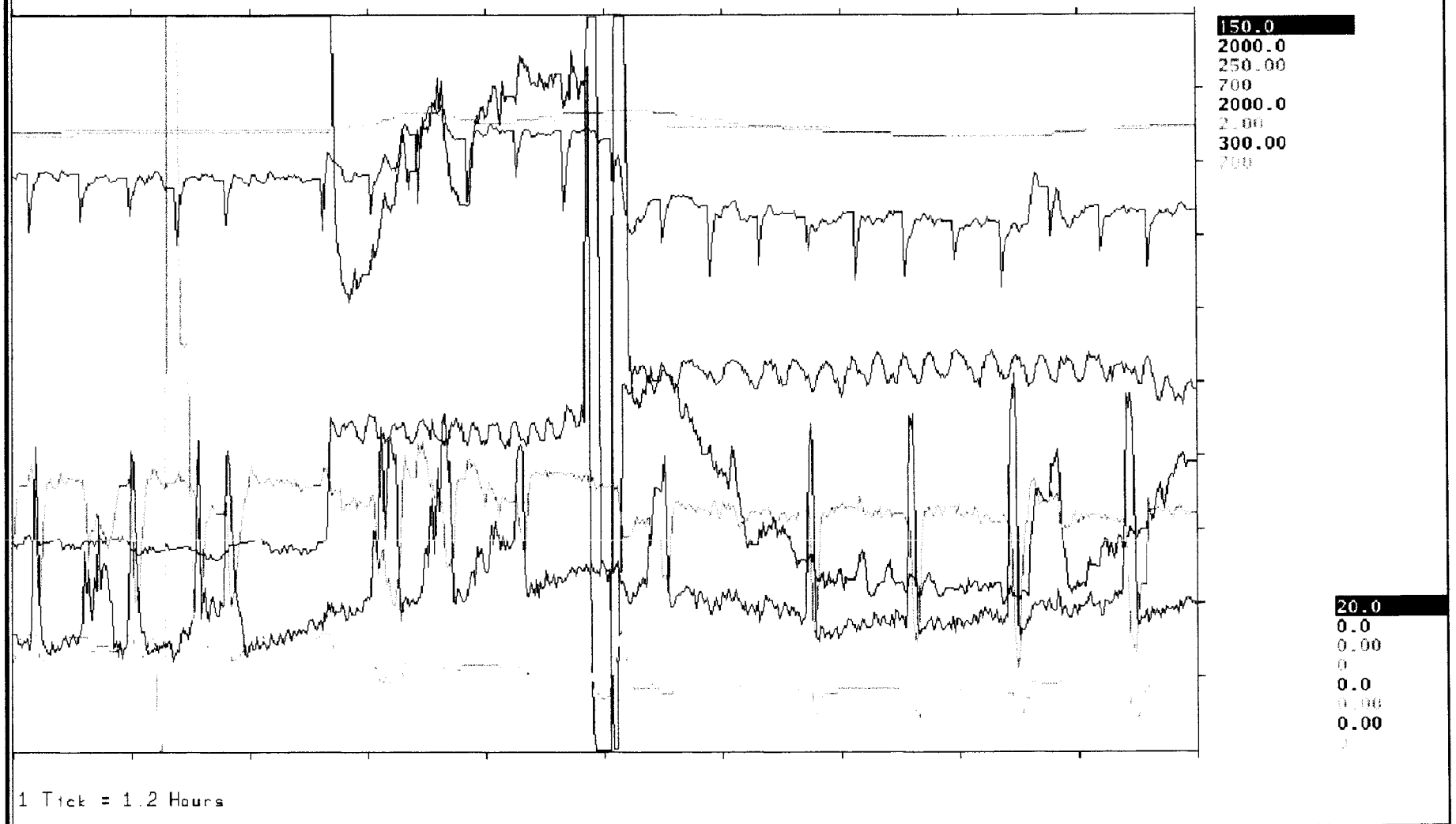
Historical Trend Display 2

30-Sep-2003
12:14:10
drop200

Select | Abort | Status | Modify... | Groups... | Create new... | Tabular | Page | Zoom | Shift

Start Time: 21-Sep-03 06:00:00 EDT End Time: 21-Sep-03 18:09:59 EDT Period: 00:01:13

A	U1AM15LA	SCR 11 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	AI9006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A	0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A	U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A	[illegible]	[illegible]	[illegible]	[illegible]



Retrieval is complete

IP/ HIII inHnA

BS 1 RUN 6

Historical Trend Display 1

30-Sep-2003
11:58:30
drop200

Select ✓ | Abort | Status | Modify... | Groups... | Create new... | Tabular | Page | Zoom | Shift

Start Time: 21-Sep-03 07:47:22 EDT End Time: 26-Sep-03 13:17:21 EDT Period: 00:12:33

A 0012X067	TOTAL MEGAWATTS(TO LDC)	MW	ACTUAL VAL
A U1MM16RA	STACK TEMPERATURE	DEGF	ACTUAL VAL
A U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
A U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A U1AM00FX	AIR FUEL RATIO	LEVEL	ACTUAL VAL
A U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A U1GM01PX	NET GENERATION CALC	MWHR	ACTUAL VAL

Time Value Display 1

DATE: 24-Sep-03

TIME: 03:33:34

POINT NAME		VALUES
0012X067	ACTUAL VAL	332.7
U1MM16RA	ACTUAL VAL	272.30
U1AT06VA	ACTUAL VAL	613
U1AT06UA	ACTUAL VAL	629
U1AM05CX	ACTUAL VAL	7.92
U1AM00FX	ACTUAL VAL	11
U1EF16AX	ACTUAL VAL	140.06
U1GM01PX	ACTUAL VAL	297.47

700.0
500.00
1100
1100
10.00
40
500.00
1125.00

0.0
0.00
32
32
0.00
0
0.00
0.00

1 Tick = 12.6 Hours

Retrieval is complete

BS 1 RUN 6

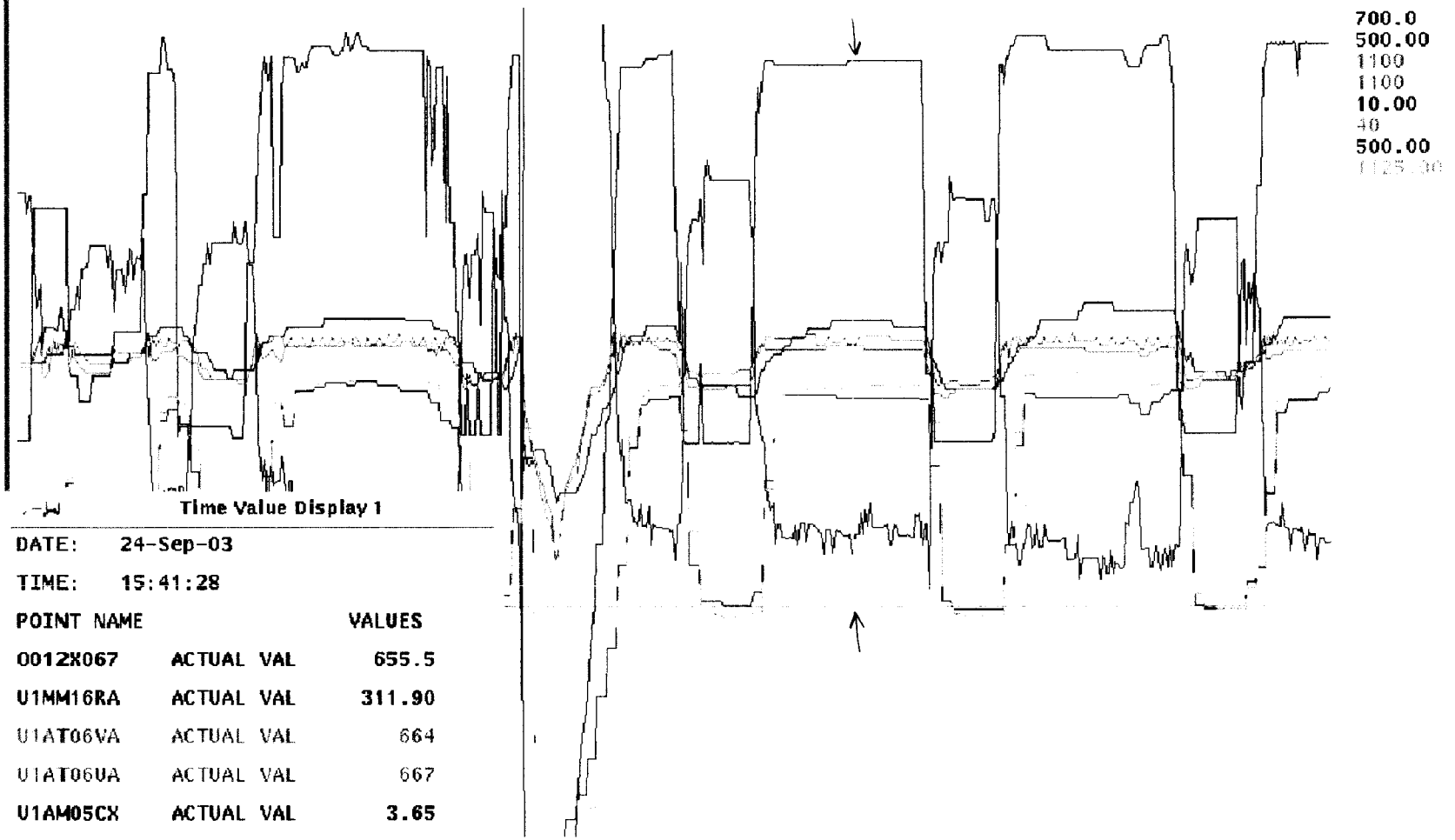
Historical Trend Display 1

30-Sep-2003
11:57:57
drop200

Select ✓ | Abort | Status | Modify... | Groups... | Create new... ▽ | Tabular | Page ▽ | Zoom ▽ | Shift ▽

Start Time: 21-Sep-03 07:47:22 EDT End Time: 26-Sep-03 13:17:21 EDT Period: 00:12:33

A 0012X067	TOTAL MEGAWATTS(TO LDC)	MW	ACTUAL VAL
A U1MM16RA	STACK TEMPERATURE	DEGF	ACTUAL VAL
A U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
A U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A U1AM00FX	ATR FUEL RATIO	LB/LB	ACTUAL VAL
A U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A [illegible]	NET GENERATION RATE	MWHR	ACTUAL VAL



Time Value Display 1

DATE: 24-Sep-03

TIME: 15:41:28

POINT NAME		VALUES
0012X067	ACTUAL VAL	655.5
U1MM16RA	ACTUAL VAL	311.90
U1AT06VA	ACTUAL VAL	664
U1AT06UA	ACTUAL VAL	667
U1AM05CX	ACTUAL VAL	3.65
U1AM00FX	ACTUAL VAL	11
U1EF16AX	ACTUAL VAL	264.38
[illegible]	ACTUAL VAL	607.26

BS1 RUN 6

Historical Trend Display 2

Select | Abort | Status | Modify... | Groups... | Create new... | Tabular | Page

Start Time: 21-Sep-03 18:00:00 EDT End Time: 26-Sep-03 12:08:34 EDT Period: 0

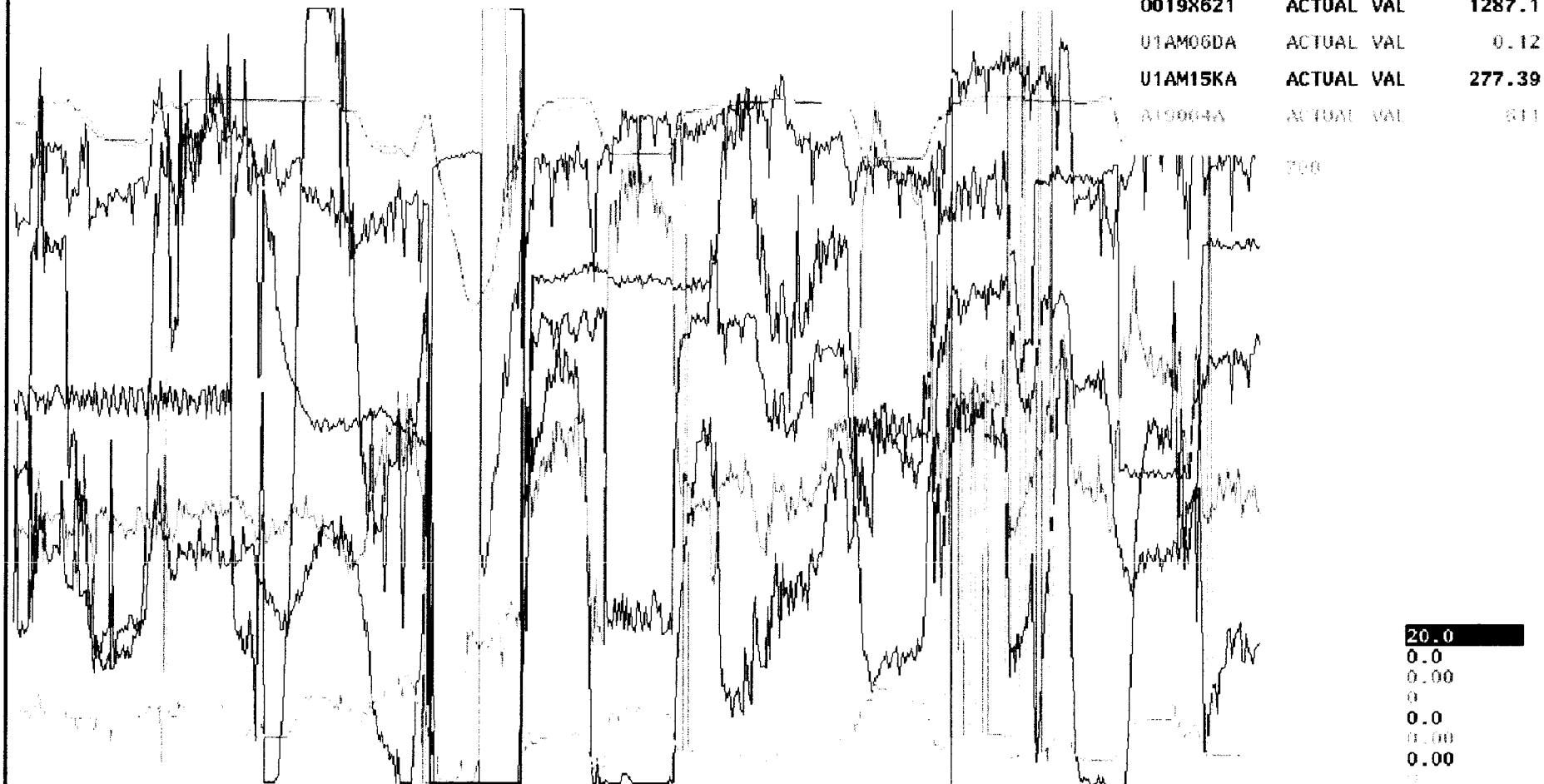
A	U1AM15LA	SCR 11 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A	A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A	0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A	U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A	[illegible]	[illegible]	[illegible]	[illegible]

Time 30-Sep-2003 12:20:59

DATE: 25-Sep-03

TIME: 08:07:52 drop200

POINT NAME		VALUES
U1AM15LA	ACTUAL VAL	77.8
0019X121	ACTUAL VAL	1465.3
U1AM15MA	ACTUAL VAL	126.40
A19006A	ACTUAL VAL	617
0019X621	ACTUAL VAL	1287.1
U1AM06DA	ACTUAL VAL	0.12
U1AM15KA	ACTUAL VAL	277.39
A19004A	ACTUAL VAL	611



1 Tick = 11.4 Hours

Retrieval is complete

BS1 RUN6

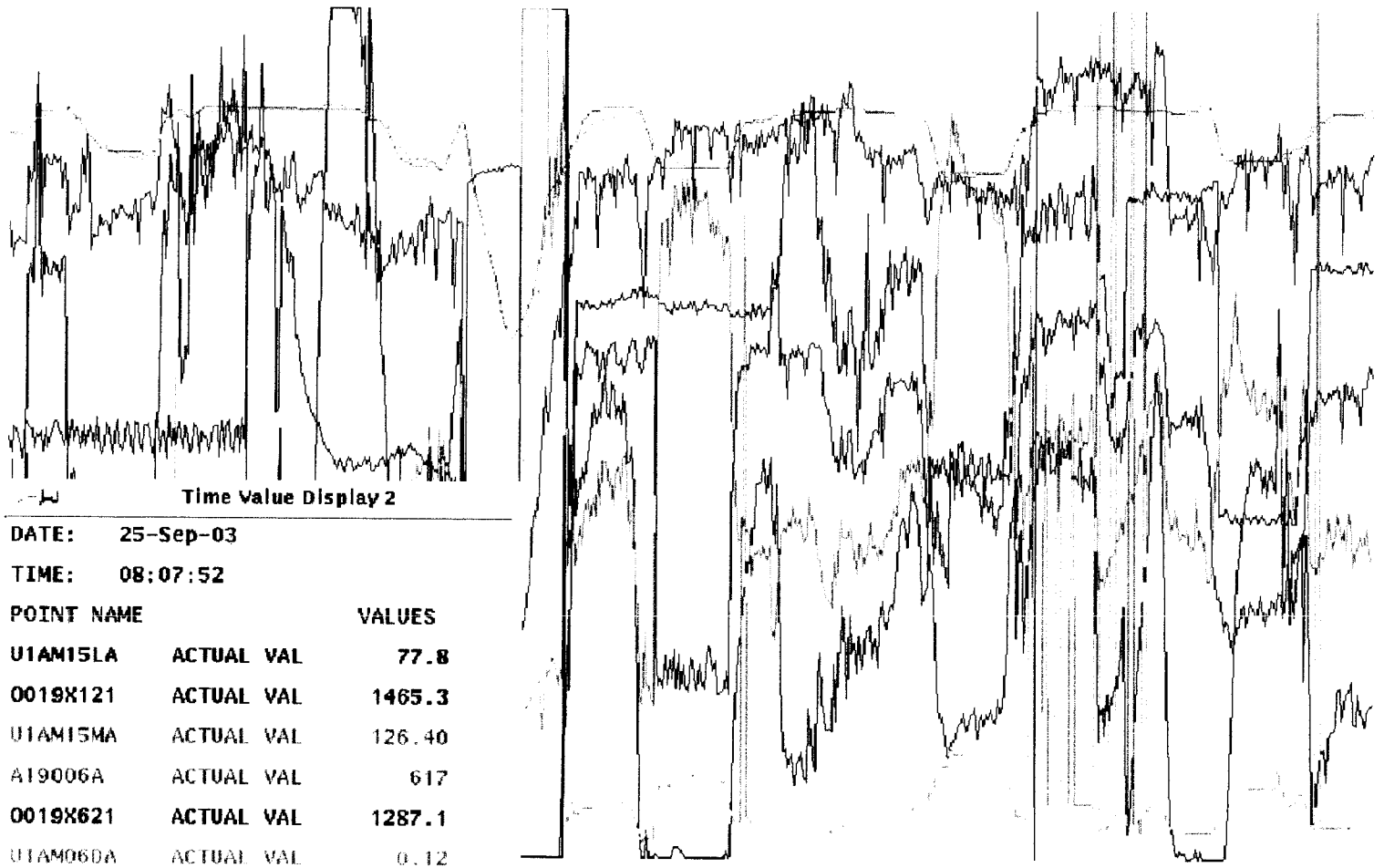
Historical Trend Display 2

30-Sep-2003
12:21:13
drop200

Select | Abort | Status | Modify... | Groups... | Create new... | Tabular | Page | Zoom | Shift

Start Time: 21-Sep-03 18:00:00 EDT End Time: 26-Sep-03 12:08:34 EDT Period: 00:11:26

A U1AM15LA	SCR 11 OUTLET FLUE NOX	PPM	ACTUAL VAL
A 0019X121	11 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A U1AM15MA	SCR 12 OUTLET FLUE NOX	PPM	ACTUAL VAL
A A19006A	SCR 12 INLET TEMP AVG	DEGF	ACTUAL VAL
A 0019X621	12 SCR AMMONIA FLOW	LB/HR	ACTUAL VAL
A U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	LB/MBT	ACTUAL VAL
A U1AM15KA	SCR 12 INLET FLUE NOX	PPM	ACTUAL VAL
A [illegible]	[illegible]	[illegible]	[illegible]



Time Value Display 2

DATE: 25-Sep-03

TIME: 08:07:52

POINT NAME		VALUES
U1AM15LA	ACTUAL VAL	77.8
0019X121	ACTUAL VAL	1465.3
U1AM15MA	ACTUAL VAL	126.40
A19006A	ACTUAL VAL	617
0019X621	ACTUAL VAL	1287.1
U1AM06DA	ACTUAL VAL	0.12
U1AM15KA	ACTUAL VAL	277.39
[illegible]	[illegible]	[illegible]

inHnA

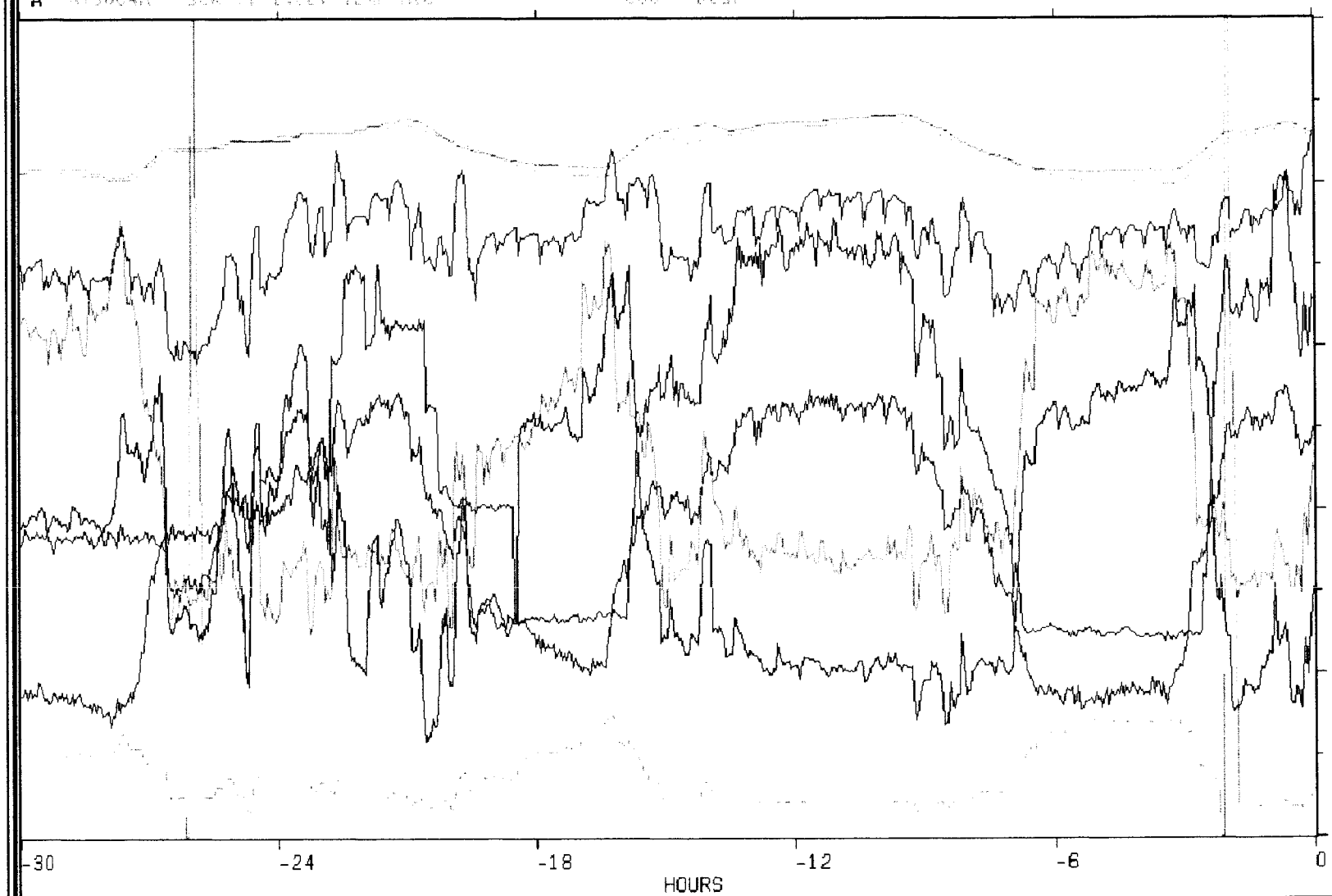
BS 1 TEST 7

Trend Display 1 – 30 hours

01-Oct-2003
09:38:28
drop200

Select ✔ Modify... Groups... Create New Tabular... Defaults...

A	U1AM15LA	SCR 11 OUTLET FLUE NOX	76.1	PPM
A	0019X121	11 SCR AMMONIA FLOW	1287.7	LB/HR
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	113.66	PPM
A	A19006A	SCR 12 INLET TEMP AVG	601	DEGF
A	0019X621	12 SCR AMMONIA FLOW	944.1	LB/HR
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	0.12	LB/MBT
A	U1AM15KA	SCR 12 INLET FLUE NOX	258.98	PPM
A	A19004A	SCR 11 INLET TEMP AVG	600	DEGF



BS 1 TEST 7

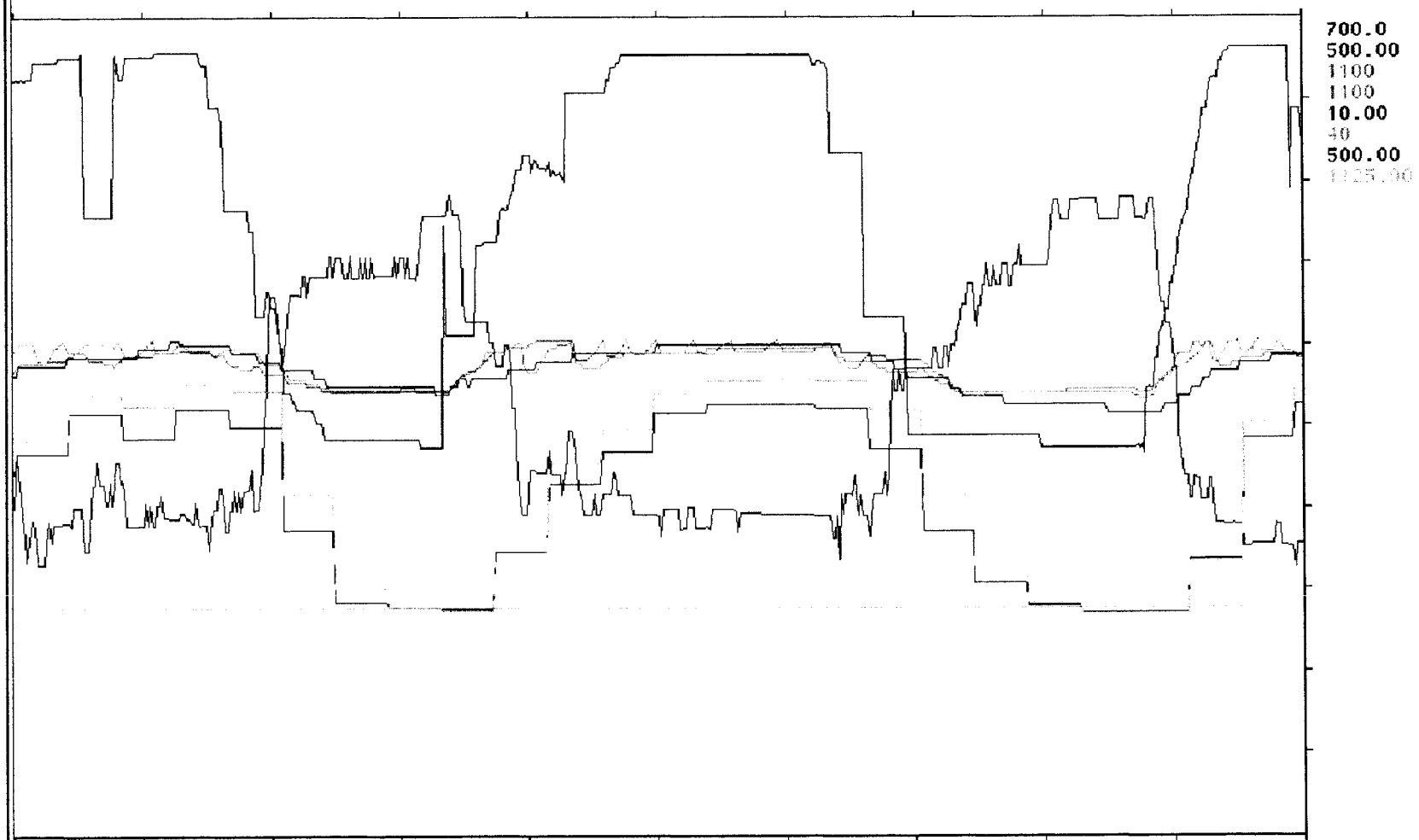
Historical Trend Display 1

01-Oct-2003
09:36:57
drop200

Select ✓ | Abort | Status | Modify... | Groups... | Create new... ▽ | Tabular | Page ▽ | Zoom ▽ | Shift ▽

Start Time: 30-Sep-03 09:00:00 EDT End Time: 01-Oct-03 09:09:59 EDT Period: 00:02:25

A	O012X067	TOTAL MEGAWATTS(TO LDC)	MW	ACTUAL VAL
A	U1MM16RA	STACK TEMPERATURE	DEGF	ACTUAL VAL
A	U1AT06VA	GAS FROM ECON TO PRECIP 12	DEGF	ACTUAL VAL
A	U1AT06UA	GAS FROM ECON TO PRECIP 11	DEGF	ACTUAL VAL
A	U1AM05CX	OXYGEN AVERAGE	PCT	ACTUAL VAL
A	U1AM00FX	ATR FUEL RATIO	LB/LB	ACTUAL VAL
A	U1EF16AX	TOTAL UNIT COAL FLOW	TON/HR	ACTUAL VAL
A	U1GM01PX	NET GENERATION AVG	MWHR	ACTUAL VAL



Retrieval is complete

BS 1 Tests 8,9,10 SCR out

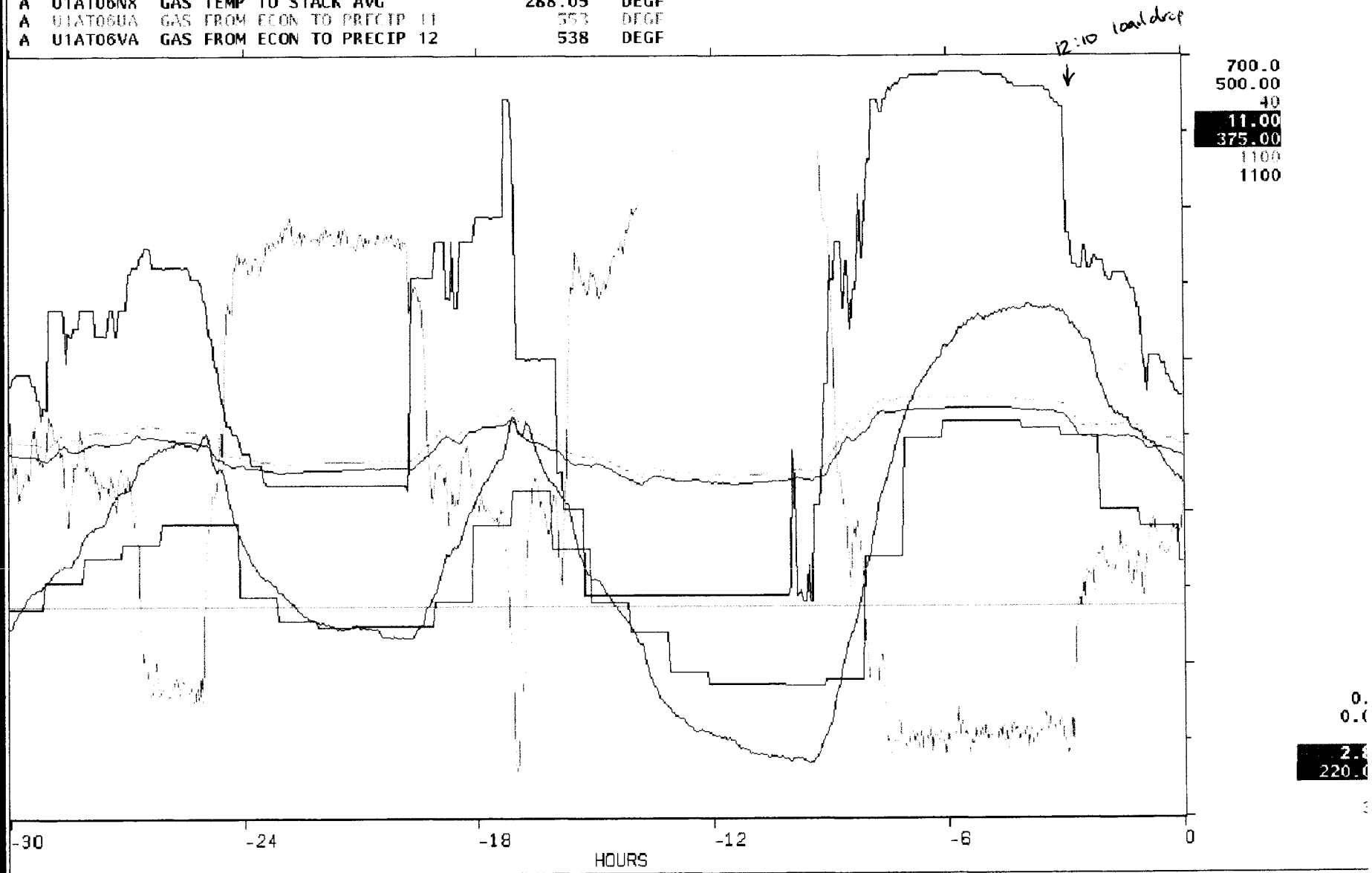
DATA | Brandon Shores U1 | Sequence | Historical

03-Oct-2003
15:07:02
drop200

Trend Display 1 – 30 hours

Select | Modify... | Groups... | Create New | Tabular... | Defaults...

A	0012X067	TOTAL MEGAWATTS(TO LDC)	388.1	MW
A	U1EF16AX	TOTAL UNIT COAL FLOW	167.30	TON/HR
A	U1AM00FX	AIR-FUEL RATIO	11	LB\LB
A	U1AM05GX	OXYGEN AVERAGE	6.04	PCT
A	U1AT06NX	GAS TEMP TO STACK AVG	288.05	DEGF
A	U1AT06UA	GAS FROM ECON TO PRECIP 11	553	DEGF
A	U1AT06VA	GAS FROM ECON TO PRECIP 12	538	DEGF



BS 1 TESTS 8,9,10 SO2 OUT

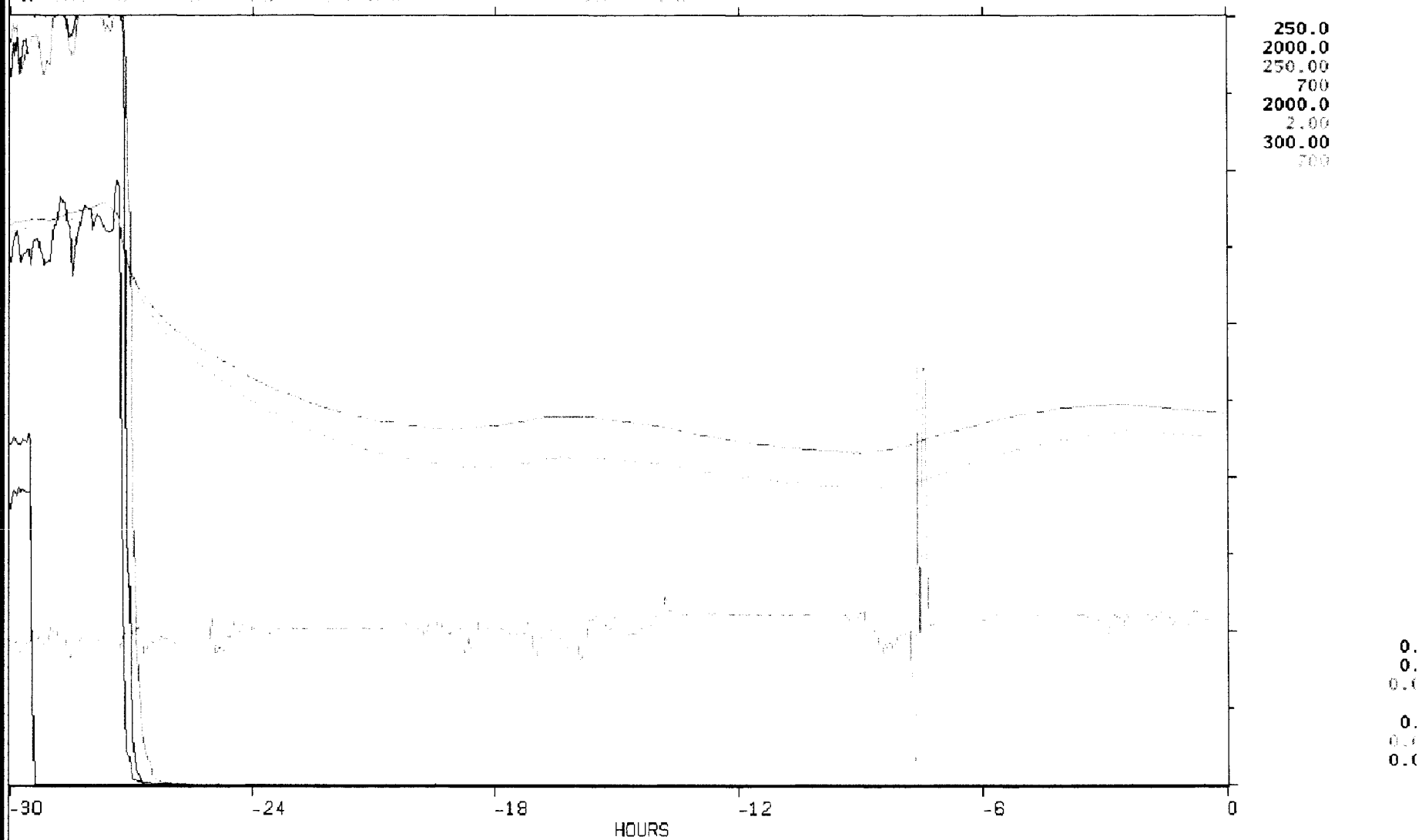
[redacted] DATA | Brandon Shores U1 | [redacted] Sequence | [redacted] Historical | [redacted]

03-Oct-2003
15:09:48
drop200

Trend Display 1 – 30 hours

Select | Modify... | Groups... | Create New | Tabular... | Defaults...

A	U1AM15LA	SCR 11 OUTLET FLUE NOX	-0.2	PPM
A	0019X121	11 SCR AMMONIA FLOW	0.0	LB/HR
A	U1AM15MA	SCR 12 OUTLET FLUE NOX	-0.02	PPM
A	A19006A	SCR 12 INLET TEMP AVG	338	DEGF
A	0019X621	12 SCR AMMONIA FLOW	0.0	LB/HR
A	U1AM06DA	STACK NOX EMISSIONS (LB/MMBTU)	0.44	LB/MBT
A	U1AM15KA	SCR 12 INLET FLUE NOX	0.16	PPM
A	[illegible]	[illegible]	[illegible]	[illegible]



RUNS 1-3 BS 2

WES

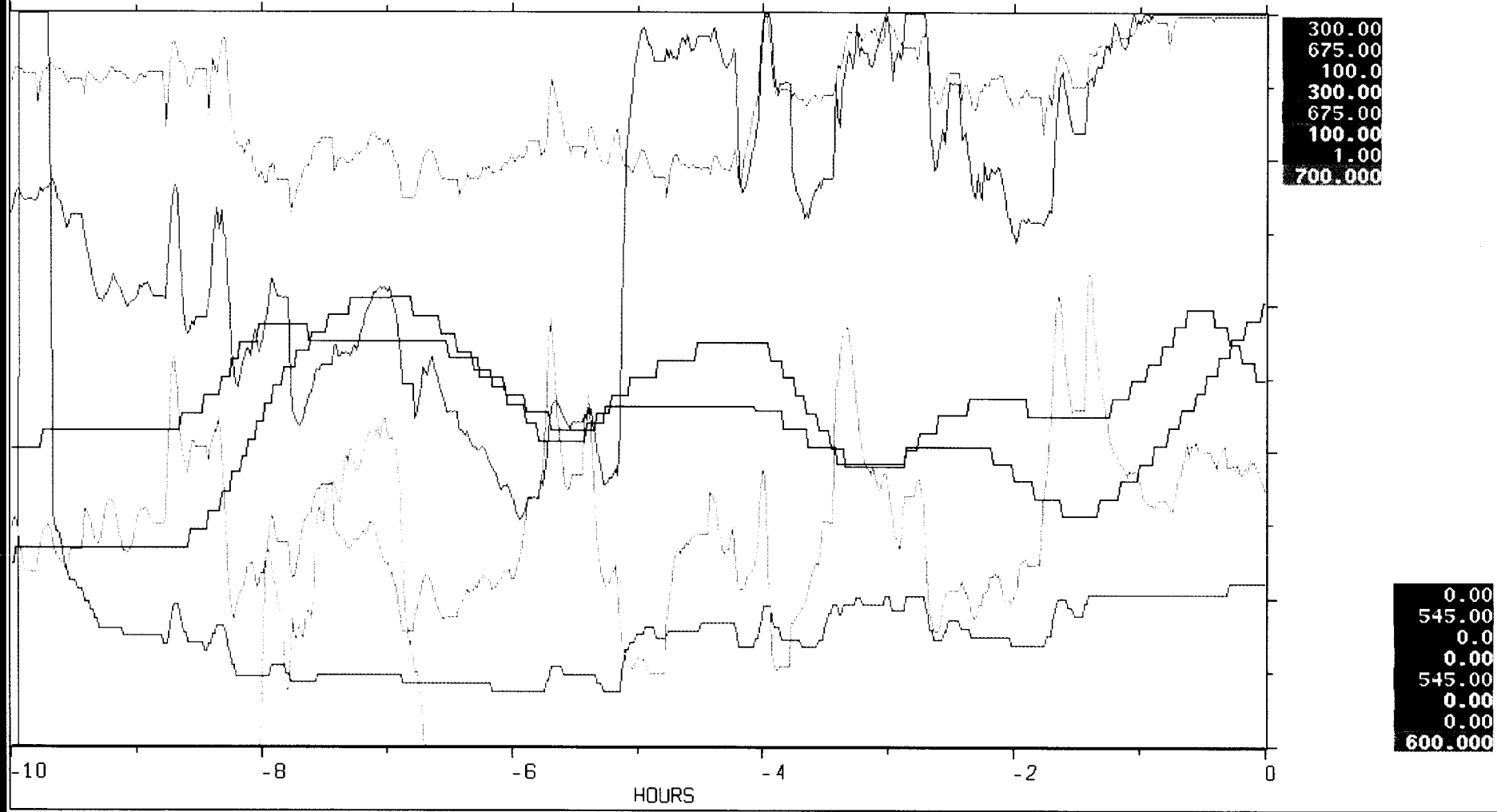
DATA ANALYSIS | CRO Menu | Brandon Shores U2 | CUSTOM | PROCESS DIAGRAM

21-Sep-2003
17:40:41
drop200

Trend Display 1 – 10 hours

Select | Modify... | Groups... | Create New | Tabular... | Defaults...

A	U2AM15JA	SCR 21 INLET FLUE NOX	-0.29	PPM
A	A19004A	SCR 21 INLET AVG TEMP	623.93	DEGF
A	U2AM15LA	SCR 21 OUTLET FLUE NOX	128.8	PPM
A	U2AM15KA	SCR 22 INLET FLUE NOX	299.18	PPM
A	A19006A	SCR 22 INLET AVG TEMP	608.52	DEGF
A	U2AM15MA	SCR 22 OUTLET FLUE NOX	33.63	PPM
A	U2AM06DA	STACK NOX EMISSIONS (LB/MBTU)	0.22	LB/MBT
A	U2GE02DA	GENERATOR LOAD	558.582	MW



retrieval from HSR complete

BS 2

WES

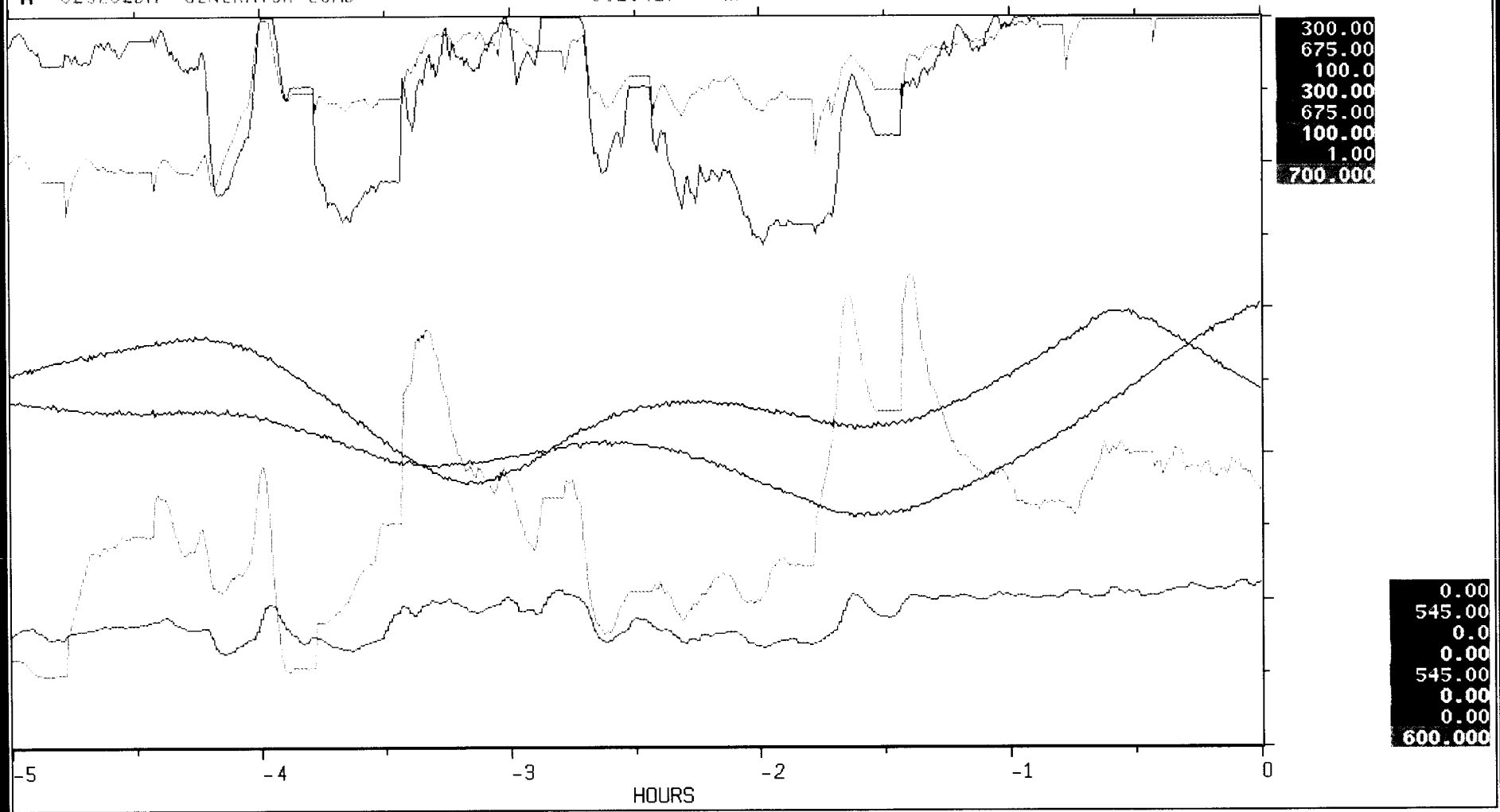
DATA ANALYSIS | CRO Menu | Brandon Shores U2 | CUSTOM | PROCESS DIAGRAM

21-Sep-2003
17:40:14
drop200

Trend Display 1 – 5 hours – MERCURY TESTING 2

Select | Modify... | Groups... | Create New | Tabular... | Defaults...

A	U2AM15JA	SCR 21 INLET FLUE NOX	-0.38	PPM
A	A19004A	SCR 21 INLET AVG TEMP	623.93	DEGF
A	U2AM15LA	SCR 21 OUTLET FLUE NOX	130.1	PPM
A	U2AM15KA	SCR 22 INLET FLUE NOX	299.08	PPM
A	A19006A	SCR 22 INLET AVG TEMP	608.71	DEGF
A	U2AM15MA	SCR 22 OUTLET FLUE NOX	34.09	PPM
A	U2AM06DA	STACK NOX EMISSIONS (LB/MBTU)	0.22	LB/MBT
A	U2GE02DA	GENERATOR LOAD	562.427	MW



RUNS 1-3 BS-2

WFS

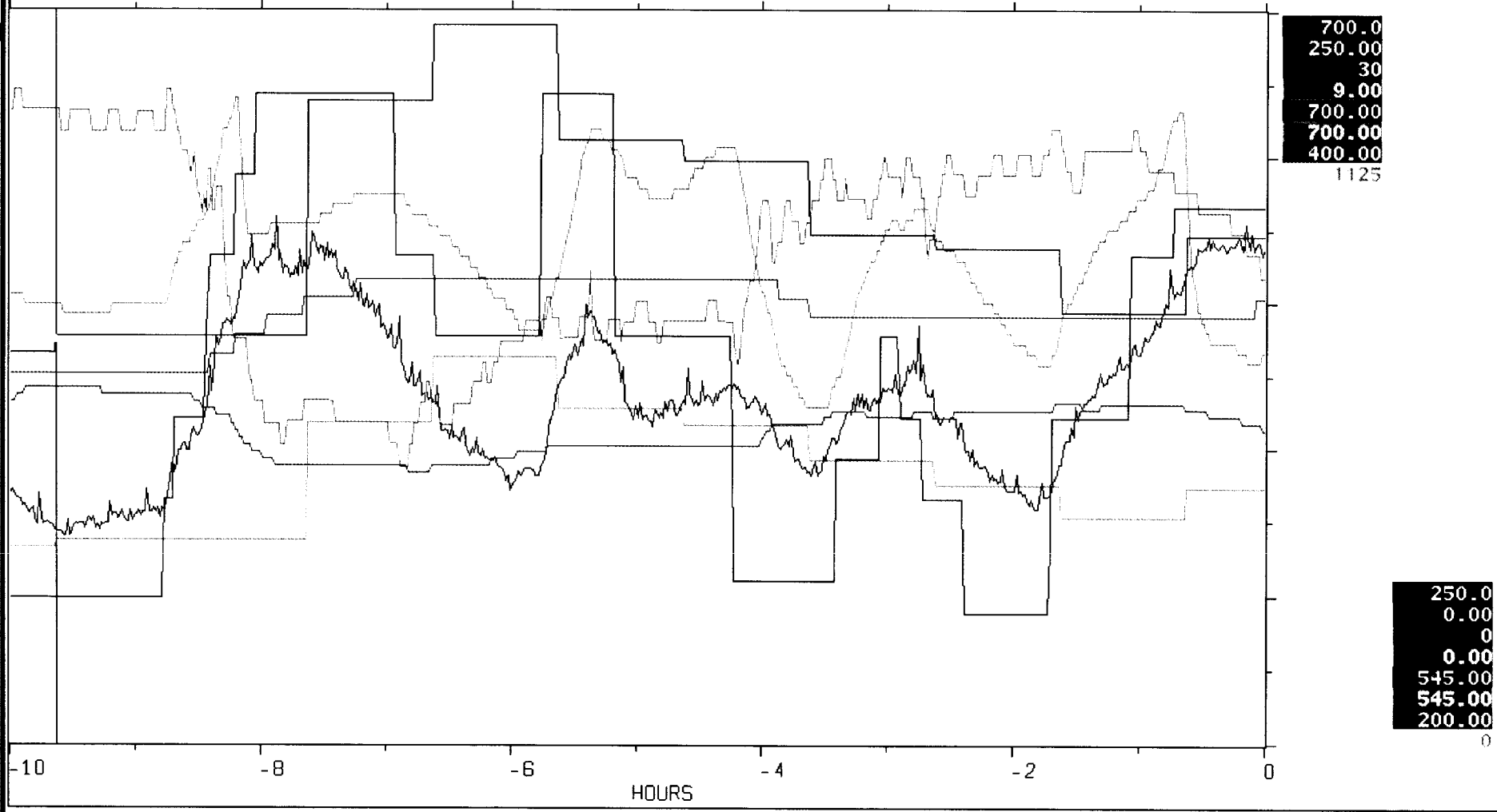
DATA ANALYSIS | CRO Menu | Brandon Shores U2 | CUSTOM

21-Sep-2003
17:38:51
drop200

Trend Display 1 - 10 hours

Select | Modify... | Groups... | Create New | Tabular... | Defaults...

A	0012X067	TOTAL MEGAWATTS(TO LDC)	580.0	MW
A	U2EF16AX	TOTAL UNIT COAL FLOW	173.55	TON/HR
A	U2AM00FX	AIR-FUEL RATIO	13	LB\LB
A	U2AM05CX	OXYGEN AVERAGE	5.74	PCT
A	U2AT06UA	ECON 21 OUTLET GAS REMIX TEMP	650.82	DEGF
A	U2AT06VA	ECON 22 OUTLET GAS REMIX TEMP	[redacted]	DEGF
A	U2MM16RA	STACK TEMPERATURE	322.20	DEGF
A	U2GM01PX	NET GENERATION CALC	392	MWHR



retrieval from HSR complete

BACKPRESSURE

[redacted] inHgA [redacted] inHgA

[redacted] degF

Plant Name: BRSH

General Average Report

Reporting Period: 09/21/2003 to 09/21/2003

Site Name: UNIT2

Time of Report: 09/21/03 16:07

Data Averaging Type: 6m

Rolling Average Interval: 1

Date	Time	MW_P60 (mw)
09/21/03	09:06	633.92
	09:12	635.78
	09:18	638.50
	09:24	641.42
	09:30	643.43
	09:36	641.44
	09:42	622.93
	09:48	608.30
	09:54	596.96
	10:00	589.25
	10:06	577.87
	10:12	567.24
	10:18	550.96
	10:24	534.13
	10:30	523.41
	10:36	515.18
	10:42	516.53
	10:48	527.62
	10:54	551.25
	11:00	558.16
	11:06	561.10
	11:12	548.94
	11:18	532.18
	11:24	514.50
	11:30	494.53
	11:36	490.95
	11:42	497.86
	11:48	500.50
	11:54	500.83
	12:00	503.81
	12:06	502.84
	12:12	502.80
	12:18	504.38
	12:24	468.52
	12:30	439.04
	12:36	433.88
	12:42	417.80
	12:48	413.81
	12:54	406.40
	13:00	397.44
	13:06	417.29
	13:12	431.81
	13:18	436.58
	13:24	430.97
	13:30	432.63
	13:36	430.83
	13:42	441.00
	13:48	445.33
	13:54	412.95
	14:00	408.06

RUN 1 AVG LOAD = 573 MW

RUN 2 AVG LOAD = 429.7 MW

General Average Report

Reporting Period: 09/21/2003 to 09/21/2003

Site Name: UNIT2

Time of Report: 09/21/03 16:07

Data Averaging Type: 6m

Rolling Average Interval: 1

Date	Time	MW_P60 (mw)
09/21/03	14:06	406.65
	14:12	386.61
	14:18	378.07
	14:24	368.02
	14:30	361.34
	14:36	353.50
	14:42	352.77
	14:48	350.78
	14:54	389.80
	15:00	403.13
	15:06	405.94
	15:12	411.53
	15:18	413.67
	15:24	418.00
	15:30	425.62
	15:36	433.31
	15:42	446.79
	15:48	464.40
	15:54	478.20
	16:00	493.62
	16:06	-999F
	16:12	-999F
	16:18	-999F
	16:24	-999F
	16:30	-999F
	16:36	-999F
	16:42	-999F
	16:48	-999F
	16:54	-999F
	17:00	-999F
	17:06	-999F

RUN 3 AVG LOAD = 490.6 (FROM COM DATA)

Average =	481.94
Maximum =	643.43
Minimum =	350.78
Possible Values =	81
Included Values =	70
Total =	33735.59

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

APPENDIX C.2

CRANE STATION DATA

CAMPAIGN ONE

CP Crane PI Data - Mercury Testing Support Data Unit 1

		Flue Ga		Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	ot Blowi
	Load	OFA	O_2 (2 m	Air In	Air Out	Gas In	Gas Out	11A	11B	12A	12B	11A	11B	12A	12B	DP	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h2o	psig
Date & Time	C1AI22	C1.O00	C1.A852	C1TE347	C1TE348	C1TE349	C1TE351B	C1FT037	C1FT038	C1FT039	C1FT040	C1AI600	C1AI610	C1AI620	C1AI630	C1PT215	C1PT219
4/23/03 10:00	199	25.00	2.85	87.2	548.2	659.9	287.4	293.3	292.0	290.9	293.7	17.6	17.6	17.4	17.7	6.9	462.3
4/23/03 10:10	199	25.00	2.85	87.1	549.4	661.3	288.5	295.3	292.7	294.7	295.8	17.6	17.6	17.4	17.7	6.9	462.5
4/23/03 10:20	200	25.00	2.85	87.0	550.5	662.7	289.6	296.5	293.0	293.4	295.5	17.6	17.6	17.3	17.7	6.9	462.7
4/23/03 10:30	200	25.00	2.85	87.0	551.6	664.0	290.7	294.8	293.2	293.6	296.0	17.6	17.6	17.3	17.7	6.9	462.9
4/23/03 10:40	200	25.00	2.85	86.9	552.8	665.4	291.8	288.7	292.0	292.0	293.8	17.6	17.6	17.3	17.7	7.0	463.1
4/23/03 10:50	200	25.00	2.86	86.9	553.9	666.8	292.9	294.0	298.0	294.0	292.7	17.6	17.6	17.2	17.7	7.0	463.3
4/23/03 11:00	201	25.00	2.86	86.8	555.0	668.2	294.0	294.4	293.8	290.6	292.7	17.6	17.6	17.2	17.7	7.0	463.5
4/23/03 11:10	200	25.00	2.86	86.7	556.2	669.5	295.1	299.7	302.2	291.5	294.6	17.6	17.6	17.2	17.7	7.0	463.7
4/23/03 11:20	200	25.00	2.86	86.7	557.3	670.9	296.2	299.5	294.1	294.2	296.9	17.6	17.6	17.1	17.7	7.1	463.9
4/23/03 11:30	200	25.00	2.86	86.6	558.4	672.3	297.3	288.6	290.7	297.7	293.4	17.6	17.6	17.1	17.7	7.1	464.1
4/23/03 11:40	199	25.00	2.86	86.6	559.6	673.7	298.4	299.6	297.1	296.7	296.8	17.6	17.6	17.1	17.7	7.1	464.3
4/23/03 11:50	200	25.00	2.86	86.5	560.7	675.0	299.5	300.1	298.4	299.8	298.2	17.6	17.6	17.0	17.8	7.1	464.5
4/23/03 12:00	200	25.00	2.86	86.4	561.9	676.4	300.7	297.5	294.6	298.6	295.7	17.6	17.6	17.0	17.8	7.2	464.7
4/23/03 12:10	200	25.00	2.86	86.4	563.0	677.8	301.8	295.3	300.4	295.5	295.5	17.6	17.6	17.0	17.8	7.2	464.9
4/23/03 12:20	201	25.00	2.86	86.3	564.1	679.2	302.9	301.7	298.4	297.3	298.4	17.6	17.6	16.9	17.8	7.2	465.1
4/23/03 12:30	201	25.00	2.86	86.3	565.3	680.5	304.0	297.8	295.9	299.8	297.7	17.6	17.6	17.0	17.8	7.2	465.3
4/23/03 12:40	199	25.00	2.86	86.2	566.4	681.9	305.0	301.4	300.2	301.7	299.8	17.6	17.6	17.4	17.8	7.2	465.5
4/23/03 12:50	199	25.00	2.87	86.3	567.5	683.3	305.1	301.7	300.2	298.1	295.7	17.6	17.6	17.5	17.8	7.3	465.7
4/23/03 13:00	199	25.00	2.87	86.5	568.7	684.6	305.2	294.9	293.8	294.6	297.1	17.6	17.6	17.6	17.8	7.3	465.9
4/23/03 13:10	199	25.00	2.87	86.6	569.8	686.0	305.3	308.2	298.6	299.2	299.8	17.6	17.6	17.7	17.8	7.3	466.1
4/23/03 13:20	199	25.00	2.87	86.7	570.9	687.4	305.5	300.3	295.5	297.2	298.8	17.6	17.6	17.8	17.8	7.3	466.3
4/23/03 13:30	198	25.00	2.87	86.8	572.0	687.9	305.6	293.7	290.6	293.5	290.7	17.6	17.6	17.9	17.8	7.4	466.5
4/23/03 13:40	199	25.00	2.87	87.0	572.0	688.1	305.7	292.8	296.0	296.9	294.8	17.6	17.6	17.9	17.8	7.3	466.7
4/23/03 13:50	200	25.00	2.87	87.1	572.1	688.2	305.8	290.9	298.9	295.3	296.5	17.6	17.6	17.9	17.8	7.3	466.9
4/23/03 14:00	200	25.00	2.87	87.2	572.1	688.4	306.0	296.4	288.9	292.4	291.3	17.6	17.6	17.9	17.9	7.3	467.1
4/23/03 14:10	200	25.00	2.87	87.3	572.2	688.5	306.1	296.2	297.8	296.4	295.1	17.6	17.6	17.2	17.9	7.3	467.3
4/23/03 14:20	200	25.00	2.87	87.4	572.2	688.7	306.2	294.0	296.6	292.2	293.5	17.6	17.7	17.2	17.9	7.2	467.5
4/23/03 14:30	200	25.00	2.87	87.6	572.3	688.9	306.3	291.3	291.2	289.5	293.5	17.6	17.7	17.3	17.9	7.2	467.7
4/23/03 14:40	200	25.00	2.87	87.7	572.3	689.0	306.4	292.4	294.5	293.7	294.8	17.6	17.7	17.4	17.9	7.2	467.9
4/23/03 14:50	200	25.00	2.88	87.8	572.4	689.2	306.6	292.2	288.2	285.8	289.5	17.6	17.7	17.5	17.9	7.2	468.1
4/23/03 15:00	200	25.00	2.88	87.9	572.5	689.3	306.7	285.3	281.1	284.2	281.1	17.6	17.7	17.5	17.9	7.2	468.3
4/23/03 15:10	201	25.00	2.88	88.1	572.5	689.5	306.8	282.0	288.4	287.1	288.1	17.6	17.8	17.6	17.9	7.1	468.5

CP Crane PI Data - Mercury Testing Support Data Unit 1

		Flue Ga		Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	ot Blowi
	Load	OFA	O_2 (2 m	Air In	Air Out	Gas In	Gas Out	11A	11B	12A	12B	11A	11B	12A	12B	DP	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h2o	psig
Date & Time	C1AI22	C1.O00	C1.A852	C1TE347	C1TE348	C1TE349	C1TE351B	C1FT037	C1FT038	C1FT039	C1FT040	C1AI600	C1AI610	C1AI620	C1AI630	C1PT215	C1PT219
4/23/03 15:20	201	25.00	2.88	88.2	572.6	689.7	306.9	292.4	289.9	286.7	285.8	17.6	17.8	17.6	17.9	7.1	468.7
4/23/03 15:30	200	25.00	2.88	88.3	572.6	689.8	307.0	285.0	287.2	288.0	286.7	17.7	17.8	17.7	17.9	7.1	468.9
4/23/03 15:40	200	25.00	2.88	88.4	572.7	690.0	307.2	282.0	286.6	283.5	283.1	17.6	17.8	17.8	17.9	7.1	469.1
4/23/03 15:50	200	25.00	2.88	88.5	572.7	690.1	307.3	286.0	289.4	293.3	288.0	17.6	17.7	17.9	17.8	7.0	469.3
4/23/03 16:00	201	25.00	2.88	88.7	572.8	690.3	307.4	283.3	289.3	286.9	284.9	17.6	17.6	18.0	17.8	7.0	469.5
4/23/03 16:10	201	25.00	2.88	88.8	572.8	690.5	307.5	285.7	285.5	289.5	287.1	17.6	17.5	18.1	17.8	7.0	469.7
4/23/03 16:20	202	25.00	2.88	88.9	572.9	690.6	307.7	291.1	285.2	284.6	287.7	17.6	17.4	18.2	17.8	7.0	469.9
4/23/03 16:30	199	25.00	2.88	89.0	573.0	690.8	307.8	283.8	286.0	289.5	286.6	17.6	17.5	18.2	17.8	6.9	470.1
4/23/03 16:40	200	25.00	2.88	89.2	573.0	690.9	307.9	291.8	286.2	286.6	287.1	17.6	17.7	18.2	17.8	6.9	470.3
4/23/03 16:50	200	25.00	2.89	89.3	573.1	691.1	308.0	283.7	288.0	282.7	286.8	17.6	17.8	18.2	17.7	6.9	470.5
4/23/03 17:00	200	25.00	2.89	89.4	573.1	691.3	308.1	286.7	292.7	292.2	291.7	17.6	17.9	18.2	17.7	6.9	470.7
4/23/03 17:10	200	25.00	2.89	89.5	573.2	691.4	308.3	292.9	285.1	283.8	289.2	17.5	17.8	18.2	17.7	6.9	470.9
4/23/03 17:20	198	25.00	2.89	89.6	573.2	691.6	308.4	284.2	288.6	285.3	283.7	17.5	17.8	18.2	17.7	6.8	471.1
4/23/03 17:30	199	25.00	2.89	89.8	573.3	691.7	308.5	288.4	290.9	290.0	288.3	17.5	17.7	18.2	17.7	6.8	469.3
4/23/03 17:40	199	25.00	2.89	89.9	573.3	691.9	308.6	281.1	288.0	286.4	287.3	17.5	17.7	18.2	17.6	6.8	458.3
4/23/03 17:50	200	25.00	2.89	90.0	573.4	692.1	308.8	286.4	287.7	282.7	293.1	17.5	17.7	18.2	17.6	6.8	447.4
4/23/03 18:00	199	25.00	2.89	90.1	573.5	692.2	308.9	283.1	289.1	287.5	288.6	17.5	17.6	18.3	17.6	6.7	436.5
4/23/03 18:10	199	25.00	2.89	90.3	573.5	692.4	309.0	283.1	284.7	287.8	286.0	17.5	17.6	18.3	17.6	6.7	425.5
4/23/03 18:20	199	25.00	2.89	90.4	573.6	692.6	309.1	292.0	286.6	286.5	286.2	17.5	17.8	18.0	17.6	6.7	414.6
4/23/03 18:30	200	25.00	2.89	90.5	573.6	692.7	309.2	291.3	290.9	289.5	285.5	17.5	18.0	18.1	17.5	6.7	403.6
4/23/03 18:40	200	25.00	2.89	90.6	573.7	692.9	309.4	284.2	286.7	286.7	286.7	17.5	18.0	18.2	17.5	6.6	392.7
4/23/03 18:50	199	25.00	2.89	90.7	573.7	693.0	309.5	282.7	286.4	287.1	285.5	17.4	18.0	18.3	17.5	6.6	381.8
4/23/03 19:00	199	25.00	2.89	90.9	573.8	693.2	309.6	287.5	281.1	282.6	286.6	17.4	18.0	18.4	17.5	6.6	370.8
4/24/03 8:00	199	25.00	2.49	89.7	521.1	631.0	263.4	289.8	284.4	284.8	289.8	17.7	17.6	17.8	17.1	4.6	458.4
4/24/03 8:10	199	25.00	2.49	89.6	523.5	632.5	264.7	275.6	280.2	283.5	283.7	17.7	17.8	17.9	17.1	4.6	452.5
4/24/03 8:20	199	25.00	2.49	89.6	525.9	634.0	266.1	283.5	285.7	280.6	284.5	17.7	17.9	17.9	17.1	4.7	446.6
4/24/03 8:30	200	25.00	2.49	89.6	528.3	635.5	267.4	276.0	288.9	291.8	287.5	17.6	17.9	18.0	17.1	4.7	440.7
4/24/03 8:40	200	25.00	2.49	89.6	530.7	636.9	268.7	286.4	285.6	288.6	286.4	17.6	17.8	18.0	17.1	4.8	434.7
4/24/03 8:50	200	25.00	2.48	89.6	533.1	638.4	270.0	283.8	283.6	283.5	282.3	17.6	17.7	18.1	17.1	4.8	428.8
4/24/03 9:00	200	25.00	2.48	89.6	535.5	639.9	271.3	290.4	285.3	285.3	283.7	17.6	17.7	18.1	17.1	4.9	422.9
4/24/03 9:10	200	25.00	2.48	89.6	537.8	641.4	272.6	284.4	284.2	284.6	285.7	17.6	17.6	18.0	17.0	4.9	417.0
4/24/03 9:20	200	25.00	2.48	89.6	540.2	642.9	273.9	278.9	281.6	283.8	279.5	17.5	17.8	18.0	17.0	5.0	411.1

RUN 2

CP Crane PI Data - Mercury Testing Support Data Unit 1

		Flue Ga		Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	ot Blowi
	Load	OFA	O_2 (2 m	Air In	Air Out	Gas In	Gas Out	11A	11B	12A	12B	11A	11B	12A	12B	DP	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h2o	psig
Date & Time	C1AI223	C1.O00	C1.A852	C1TE347	C1TE348	C1TE349	C1TE351B	C1FT037	C1FT038	C1FT039	C1FT040	C1AI600	C1AI610	C1AI620	C1AI630	C1PT215	C1PT219
4/24/03 9:30	200	25.00	2.47	89.6	542.6	644.4	275.3	287.5	282.7	285.5	284.9	17.5	17.8	17.9	17.0	5.0	405.1
4/24/03 9:40	200	25.00	2.47	89.5	545.0	645.9	276.6	284.2	282.4	284.0	283.3	17.5	17.9	17.7	17.0	5.1	399.2
RUN 3 4/24/03 9:50	200	25.00	2.47	89.5	547.4	647.4	277.9	279.1	279.8	282.7	278.7	17.5	17.5	18.0	17.0	5.2	393.3
4/24/03 10:00	200	25.00	2.47	89.5	549.8	648.8	279.2	284.6	285.3	281.1	283.8	17.5	17.4	18.4	17.0	5.2	400.0
4/24/03 10:10	200	25.00	2.47	89.5	552.2	650.3	280.5	278.9	282.8	288.4	284.6	17.5	17.4	18.3	17.0	5.3	408.7
4/24/03 10:20	200	25.00	2.46	89.5	554.6	651.8	281.8	288.4	285.3	283.4	285.8	17.4	17.4	18.3	17.0	5.3	417.3
4/24/03 10:30	200	25.00	2.46	89.5	557.0	653.3	283.1	282.7	284.7	286.7	284.0	17.4	17.4	18.2	17.0	5.4	425.9
4/24/03 10:40	200	25.00	2.46	89.5	559.3	654.8	284.5	277.6	279.8	283.5	284.3	17.4	17.5	18.0	17.0	5.4	434.5
4/24/03 10:50	200	25.00	2.46	89.5	561.7	656.3	285.8	277.8	283.7	285.8	282.3	17.4	17.5	17.8	17.0	5.5	443.1
4/24/03 11:00	200	25.00	2.46	89.4	564.1	657.8	287.1	282.2	285.7	279.6	282.2	17.4	17.4	17.6	16.9	5.5	451.7
L 4/24/03 11:10	200	25.00	2.45	89.4	566.3	659.2	288.4	276.4	280.9	281.6	279.5	17.3	17.1	17.5	16.9	5.6	460.3
4/24/03 11:20	200	25.00	2.45	89.4	566.3	660.7	289.7	279.2	281.1	281.8	283.0	17.3	16.8	17.5	16.9	5.7	468.9
4/24/03 11:30	200	25.00	2.45	89.4	566.4	662.2	291.0	278.8	283.7	284.2	280.6	17.3	17.0	17.5	16.9	5.7	477.5

CP Crane PI Data - Mercury Testing Support Data Unit 2

			Flue Gas	Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	Soot Blowing	
	Load	OFA	O_2 (2 min	Air In	Air Out	Gas In	Gas Out	21A	21B	22A	22B	21A	21B	22A	22B	ΔP	Hdr	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h_2o	psig	psig
Date & Time	C2.MW	.O001X7	C2.A85299C	C2TE347	C2TE348	C2TE349	C2TE351A	C2FT019	C2FT020	C2FT021	C2FT022	C2AI600	C2AI610	C2AI620	C2AI630	C2PT215	C2PT228	C2PT229
4/24/03 13:00	206	0.00	2.98	86.4	551.7	674.6	321.1	379.1	386.3	382.8	382.5	18.3	18.2	18.2	18.0	8.8	483.7	483.9
4/24/03 13:10	206	0.00	2.96	86.9	552.7	675.8	321.6	376.9	381.2	382.8	383.0	18.3	18.1	18.2	18.0	9.0	477.1	474.7
4/24/03 13:20	206	0.00	2.95	87.4	553.5	677.0	322.1	382.1	381.6	381.7	383.6	18.4	18.1	18.2	18.0	8.1	481.2	481.1
4/24/03 13:30	206	0.00	2.95	87.9	554.7	678.3	322.7	380.7	388.6	382.4	381.9	18.4	18.1	18.1	18.0	8.8	482.1	481.5
4/24/03 13:40	206	0.00	2.95	88.4	555.9	679.5	323.2	380.4	379.0	377.4	380.5	18.4	18.1	18.1	18.0	8.8	475.6	472.4
4/24/03 13:50	206	0.00	2.95	88.9	557.1	680.7	323.7	377.9	385.9	383.8	381.4	18.4	18.1	18.1	18.0	7.9	486.1	487.5
4/24/03 14:00	206	0.00	2.95	89.5	558.3	681.1	324.2	381.6	380.3	379.7	378.0	18.4	18.1	18.1	18.0	8.7	470.3	466.3
4/24/03 14:10	206	0.00	2.95	90.0	559.4	680.0	324.7	373.2	375.5	375.1	375.2	18.5	18.1	18.1	17.9	9.0	443.8	448.2
4/24/03 14:20	206	0.00	2.95	90.5	556.6	676.0	325.3	375.4	372.5	380.1	378.5	18.5	18.0	18.1	17.9	7.8	450.6	458.9
4/24/03 14:30	206	0.00	2.95	91.0	553.8	675.5	325.7	380.6	383.6	382.8	377.6	18.5	18.0	18.1	17.9	8.7	486.1	483.4
4/24/03 14:40	206	0.00	2.95	91.3	554.2	676.6	326.2	376.1	380.8	378.5	380.3	18.5	18.0	18.0	17.9	9.3	476.4	469.8
4/24/03 14:50	206	0.00	2.95	91.5	555.4	677.6	326.6	378.5	381.9	378.3	378.8	18.5	18.0	18.0	17.9	8.0	477.4	476.9
4/24/03 15:00	206	0.00	2.95	91.7	556.6	678.6	327.1	383.9	375.4	375.0	375.5	18.4	18.0	18.0	17.9	9.0	478.7	480.2
4/24/03 15:10	206	0.00	2.95	91.9	557.3	679.6	327.5	378.5	381.9	378.2	381.5	18.3	18.0	18.0	17.9	9.4	472.2	472.1
4/24/03 15:20	206	0.00	2.95	92.1	557.4	680.7	328.0	378.6	375.4	380.0	381.5	18.3	18.0	18.0	17.9	8.3	483.5	488.0
4/24/03 15:30	206	0.00	2.95	92.4	557.6	681.7	328.4	377.0	378.0	382.3	384.6	18.2	18.0	18.0	17.9	9.2	477.1	479.5
4/24/03 15:40	206	0.00	2.95	92.6	557.8	682.7	328.9	374.8	379.8	373.1	378.5	18.2	17.9	17.9	17.9	9.2	470.8	470.5
4/24/03 15:50	206	0.00	2.95	92.8	558.7	683.8	329.3	373.3	374.6	374.0	375.2	18.1	17.8	17.9	17.8	8.4	482.1	486.5
4/24/03 16:00	206	0.00	2.95	93.0	559.9	684.8	329.8	382.0	385.1	376.3	383.0	18.0	17.7	17.8	17.7	9.5	475.8	477.5
4/24/03 16:10	206	0.00	2.95	93.2	561.4	685.8	330.2	376.6	382.1	376.0	376.8	18.0	17.6	17.8	17.6	9.3	469.4	468.5
4/24/03 16:20	206	0.00	2.95	93.4	562.5	686.8	330.6	374.3	387.4	377.1	376.6	17.9	17.5	17.7	17.5	8.4	481.0	484.6
4/24/03 16:30	206	0.00	2.95	93.6	563.3	687.9	331.1	386.5	386.8	379.8	384.3	17.9	17.5	17.7	17.4	9.3	474.7	475.8
4/24/03 16:40	206	0.00	2.95	93.8	564.1	688.9	331.5	382.5	380.1	379.7	381.5	17.8	17.4	17.7	17.3	9.8	471.8	471.8
4/24/03 16:50	206	0.00	2.95	94.0	564.8	689.9	332.0	379.1	378.6	374.8	376.2	17.7	17.3	17.6	17.2	8.1	479.8	483.0
4/24/03 17:00	206	0.00	2.95	94.2	565.6	691.0	332.4	378.5	379.9	381.0	378.1	17.7	17.2	17.6	17.1	9.4	473.4	474.1
4/24/03 17:10	206	0.00	2.94	94.4	566.2	692.0	332.9	380.2	379.7	378.3	376.8	17.6	17.1	17.5	17.0	9.4	481.3	480.8
4/24/03 17:20	206	0.00	2.94	94.6	566.9	693.0	333.3	386.8	386.3	381.5	382.5	17.5	17.0	17.5	16.9	8.3	478.5	481.4
4/24/03 17:30	206	0.00	2.94	94.8	567.5	694.0	333.6	380.3	377.5	379.0	381.9	17.5	16.9	17.4	16.8	9.7	472.3	472.6
4/24/03 17:40	206	0.00	2.94	95.0	569.8	695.1	333.9	377.4	378.2	376.6	381.8	17.4	16.8	17.4	16.7	10.0	483.9	488.5
4/24/03 17:50	206	0.00	2.94	95.2	570.9	696.1	334.3	374.8	372.8	377.0	379.9	17.4	16.7	17.3	16.6	8.8	477.8	480.3
4/24/03 18:00	206	0.00	2.94	95.4	572.0	697.1	334.6	380.8	375.9	382.1	381.2	17.3	16.6	17.3	16.5	9.9	471.7	471.6

RUN 4

CP Crane PI Data - Mercury Testing Support Data Unit 2

			Flue Gas	Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	Soot Blowing	
	Load	OFA	O_2 (2 min	Air In	Air Out	Gas In	Gas Out	21A	21B	22A	22B	21A	21B	22A	22B	ΔP	Hdr	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h_2o	psig	psig
Date & Time	C2.MW	.O001X7	2.A85299C'	C2TE347	C2TE348	C2TE349	C2TE351A	C2FT019	C2FT020	C2FT021	C2FT022	C2AI600	C2AI610	C2AI620	C2AI630	C2PT215	C2PT228	C2PT229
4/24/03 18:10	206	0.00	2.94	95.6	573.1	698.2	334.9	379.5	379.9	376.0	384.3	17.2	16.5	17.3	16.4	10.0	483.2	487.7
4/24/03 18:20	206	0.00	2.94	95.8	574.2	699.2	335.3	380.9	381.2	376.8	379.2	17.2	16.4	17.2	16.3	8.9	476.9	478.9
4/24/03 18:30	206	0.00	2.94	96.0	574.7	700.2	335.6	379.8	380.3	379.9	380.5	17.1	16.3	17.2	16.2	9.5	470.6	470.0
4/25/03 7:20	202	0.00	2.92	84.4	539.6	664.6	308.1	389.6	391.2	391.2	395.0	17.5	17.7	17.3	17.7	6.9	471.6	473.0
4/25/03 7:30	203	0.00	2.92	83.7	546.2	671.9	311.9	382.1	390.1	381.3	382.8	17.5	17.7	17.3	17.8	7.7	487.4	484.1
4/25/03 7:40	202	0.00	2.92	83.0	549.8	673.8	315.7	380.5	380.3	379.9	380.8	17.5	17.7	17.3	17.8	8.2	479.5	477.3
4/25/03 7:50	203	0.00	2.92	82.8	551.7	675.9	317.2	373.9	379.5	376.3	379.0	17.5	17.7	17.3	17.9	6.8	470.0	470.5
4/25/03 8:00	203	0.00	2.93	83.1	553.5	678.3	318.1	380.3	377.6	383.3	379.7	17.5	17.7	17.3	17.9	7.8	486.0	482.0
4/25/03 8:10	204	0.00	2.93	83.3	555.5	680.6	319.0	370.4	379.4	377.0	371.5	17.5	17.7	17.3	18.0	7.9	476.8	475.4
4/25/03 8:20	204	0.00	2.93	83.6	557.7	682.9	319.9	372.6	381.4	377.7	375.8	17.5	17.7	17.3	18.0	6.7	470.8	471.0
4/25/03 8:30	204	0.00	2.93	83.9	559.7	685.0	320.8	388.7	390.5	392.3	389.2	17.4	17.7	17.4	18.1	8.0	483.7	480.2
4/25/03 8:40	205	0.00	2.94	84.2	561.4	686.2	321.7	376.8	380.1	382.5	382.9	17.4	17.7	17.4	18.1	8.3	474.8	473.9
4/25/03 8:50	205	0.00	2.94	84.4	561.0	687.4	322.7	379.4	390.3	383.6	381.0	17.4	17.7	17.4	18.2	7.4	478.7	479.2
4/25/03 9:00	205	0.00	2.94	84.7	561.9	688.5	323.6	383.2	380.6	385.1	383.2	17.4	17.7	17.4	18.2	7.9	482.2	479.2
4/25/03 9:10	205	0.00	2.94	85.0	562.8	689.7	324.5	384.0	376.6	384.3	386.3	17.4	17.7	17.4	18.3	8.3	473.3	472.8
4/25/03 9:20	206	0.00	2.95	85.2	563.7	690.9	325.4	383.0	374.1	391.1	384.3	17.4	17.7	17.4	18.3	7.4	486.7	484.3
4/25/03 9:30	206	0.00	2.95	85.5	564.6	692.1	326.3	387.0	387.6	378.1	376.3	17.4	17.7	17.4	18.4	8.2	480.5	477.9
4/25/03 9:40	206	0.00	2.95	85.8	565.5	692.8	327.2	381.5	379.4	379.7	376.1	17.4	17.7	17.4	18.4	8.5	471.5	471.4
4/25/03 9:50	206	0.00	2.95	86.0	566.2	693.3	328.1	385.1	377.7	379.5	387.0	17.4	17.7	17.5	18.5	7.2	482.2	482.8
4/25/03 10:00	206	0.00	2.95	86.3	566.9	693.7	329.0	385.6	380.6	383.0	385.0	17.4	17.7	17.5	18.5	8.6	475.9	476.5
4/25/03 10:10	206	0.00	2.96	86.6	567.7	694.2	329.9	381.4	383.4	383.6	378.1	17.4	17.7	17.5	18.6	0.0	469.6	470.2
4/25/03 10:20	206	0.00	2.96	86.8	568.4	694.7	330.3	373.8	377.2	379.4	379.9	17.3	17.7	17.5	18.6	0.2	481.1	481.7
4/25/03 10:30	205	0.00	2.96	87.1	569.1	695.1	330.4	375.4	380.3	373.4	377.1	17.3	17.8	17.5	18.6	8.4	474.8	475.4
4/25/03 10:40	205	0.00	2.96	87.4	569.7	695.6	330.6	387.0	380.5	381.5	374.5	17.3	17.8	17.5	18.7	7.6	469.7	470.0
4/25/03 10:50	205	0.00	2.97	87.7	570.1	696.2	330.7	380.1	384.0	383.2	380.3	17.3	17.8	17.5	18.7	8.2	480.0	480.6
4/25/03 11:00	205	0.00	2.97	87.9	570.0	696.8	330.8	364.9	366.0	372.3	369.1	17.3	17.8	17.5	18.8	8.4	473.7	474.3
4/25/03 11:10	205	0.00	2.97	88.2	570.1	697.5	330.9	395.7	398.1	389.6	394.5	17.3	17.8	17.6	18.8	7.8	477.4	477.3
4/25/03 11:20	204	0.00	2.97	88.2	571.2	698.2	331.1	380.8	379.4	371.7	379.7	17.3	17.8	17.6	18.9	8.1	478.9	479.4
4/25/03 11:30	204	0.00	2.98	88.2	572.3	699.0	331.2	366.1	386.3	389.2	400.4	17.3	17.8	17.6	18.9	8.8	472.6	473.0
4/25/03 11:40	204	0.00	2.98	88.3	572.8	699.8	331.3	393.9	383.0	386.1	388.4	17.3	17.8	17.6	18.9	7.9	484.1	484.3
4/25/03 11:50	204	0.00	2.98	88.3	572.3	700.5	331.5	383.9	389.2	387.7	395.7	17.3	17.8	17.6	18.8	8.6	477.8	478.0

Run 2

Run 3

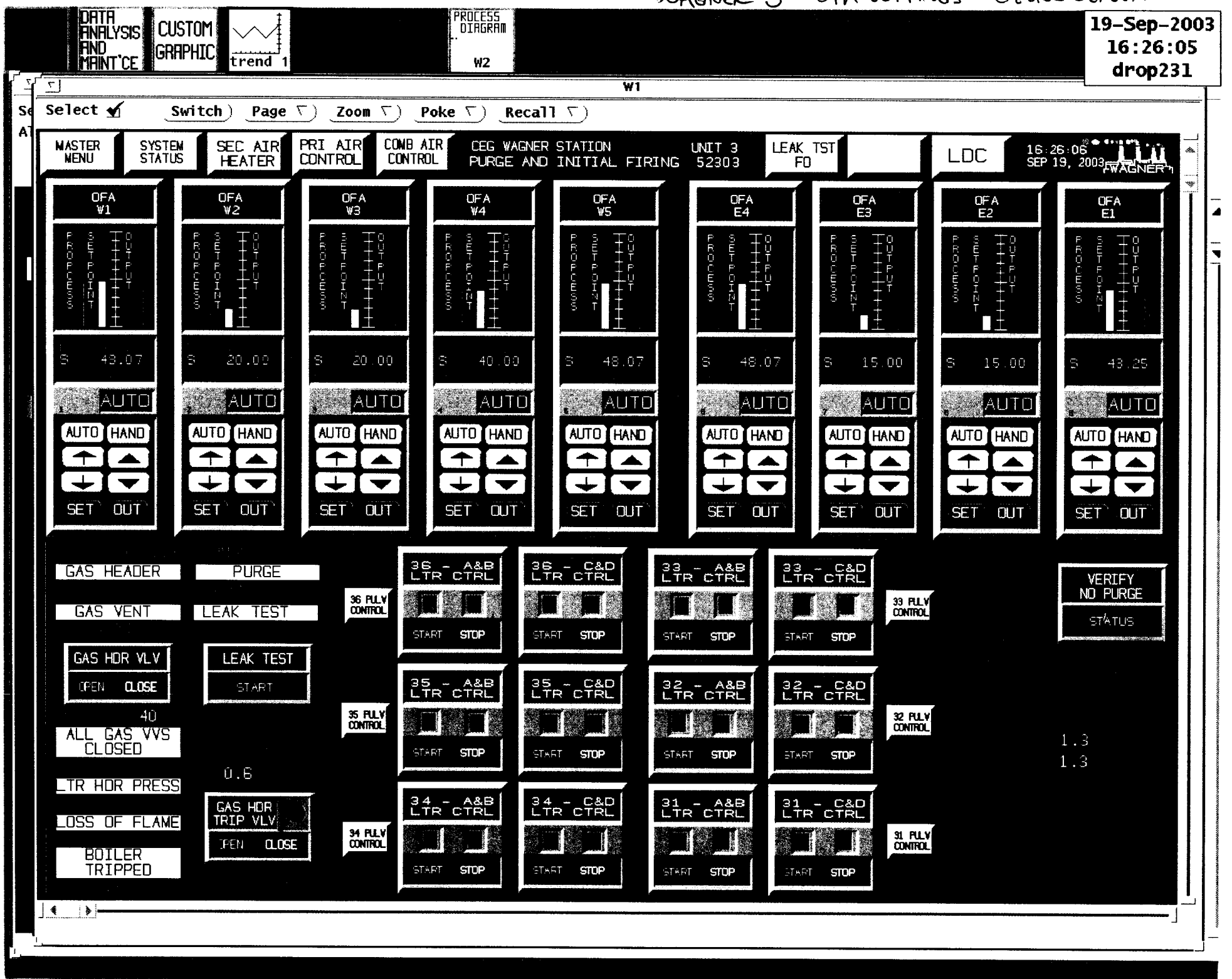
CP Crane PI Data - Mercury Testing Support Data Unit 2

				Air Heater Temps				Cyclone Air Flows				Coal Flows				Bagh'se	Soot Blowing	
	Load	OFA	Flue Gas O_2 (2 min a	Air In	Air Out	Gas In	Gas Out	21A	21B	22A	22B	21A	21B	22A	22B	ΔP	Hdr	Rec
	MW	%	%	deg F	deg F	deg F	deg F	kpph	kpph	kpph	kpph	ton/hr	ton/hr	ton/hr	ton/hr	"h_2o	psig	psig
Date & Time	C2.MW	.O001X7	2.A85299C	C2TE347	C2TE348	C2TE349	C2TE351A	C2FT019	C2FT020	C2FT021	C2FT022	C2AI600	C2AI610	C2AI620	C2AI630	C2PT215	C2PT228	C2PT229
4/25/03 12:00	204	0.00	2.98	88.3	572.3	701.3	331.6	392.3	390.9	385.7	389.7	17.3	17.8	17.6	18.8	8.9	471.4	471.6
4/25/03 12:10	204	0.00	2.99	88.3	572.4	701.4	331.7	384.4	386.4	382.5	383.9	17.3	17.8	17.6	18.7	8.0	482.9	483.1
4/25/03 12:20	204	0.00	2.99	88.3	572.5	701.5	331.8	383.7	383.9	386.2	388.6	17.2	17.8	17.6	18.7	8.8	476.6	476.8
4/25/03 12:30	204	0.00	2.99	88.3	572.7	701.6	332.0	391.0	378.6	387.5	389.9	17.2	17.8	17.7	18.6	9.0	470.4	470.6
4/25/03 12:40	205	0.00	2.99	88.3	572.8	701.7	332.1	385.2	378.8	384.8	382.7	17.2	17.8	17.7	18.6	8.3	481.9	482.1
4/25/03 12:50	205	0.00	3.00	88.3	573.1	701.8	332.2	383.7	386.5	385.9	382.7	17.2	17.8	17.7	18.6	8.6	475.7	475.9
4/25/03 13:00	205	0.00	3.00	88.3	573.4	701.9	332.3	386.2	391.7	384.6	387.0	17.2	17.8	17.7	18.5	9.0	469.5	469.7

APPENDIX C.3

WAGNER STATION DATA

CAMPAIGN TWO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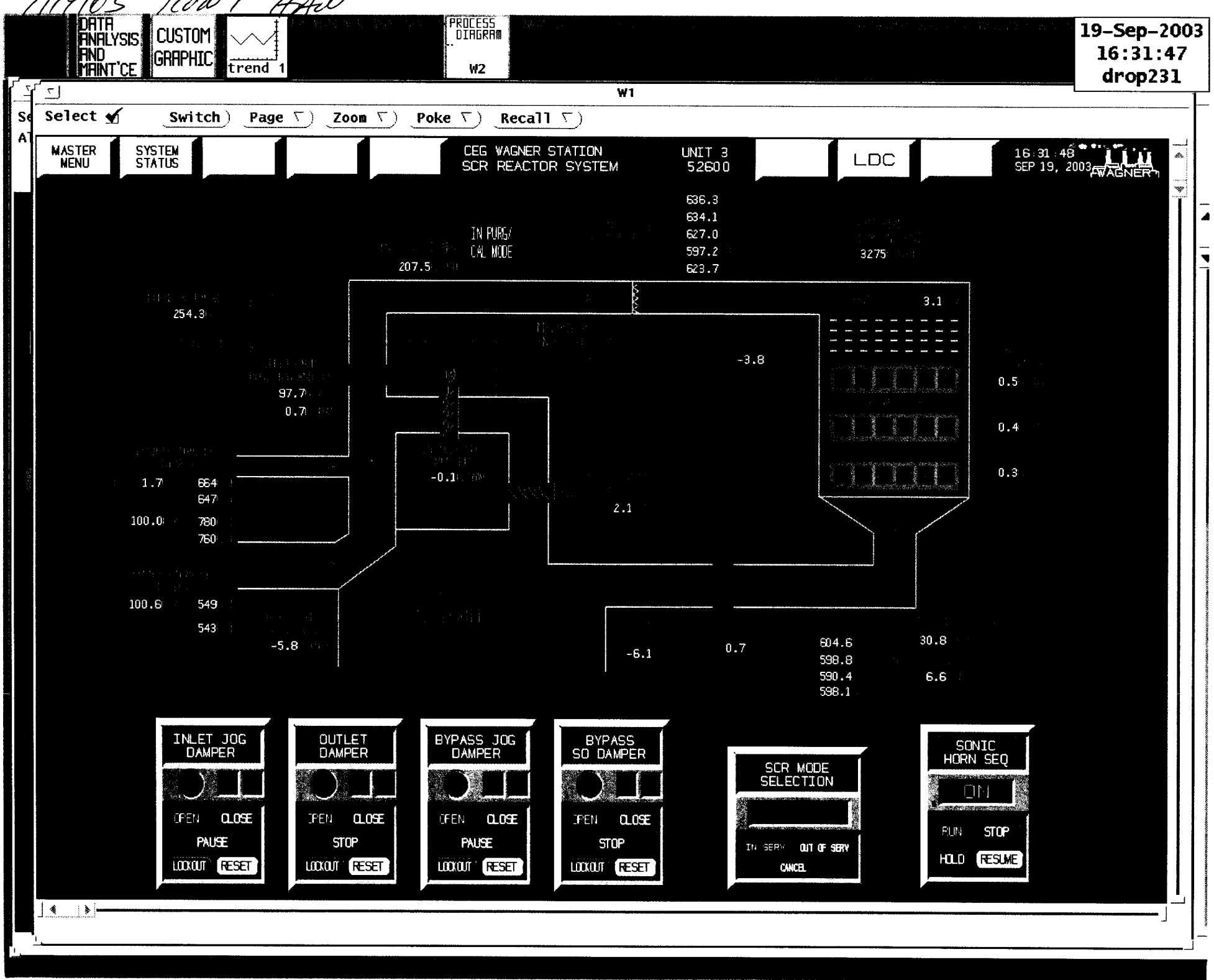
CUSTOM GRAPHIC
trend 1
PROCESS DIAGRAM
W2
19-Sep-2003
16:26:05
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
SEC AIR HEATER
PRI AIR CONTROL
COMB AIR CONTROL
CEG WAGNER STATION
PURGE AND INITIAL FIRING
UNIT 3
52303
LEAK TST
FO
LDC
16:26:06
SEP 19, 2003
WAGNER
OFA W1
OFA W2
OFA W3
OFA W4
OFA W5
OFA E4
OFA E3
OFA E2
OFA E1
PROCESS
SETPOINT
OUTPUT
S 48.07
S 20.00
S 20.00
S 40.00
S 48.07
S 48.07
S 15.00
S 15.00
S 48.25
AUTO
AUTO HAND
SET OUT
GAS HEADER
PURGE
GAS VENT
LEAK TEST
GAS HDR VLV
OPEN CLOSE
LEAK TEST
START
40
ALL GAS VVS CLOSED
0.6
LTR HDR PRESS
LOSS OF FLAME
BOILER TRIPPED
GAS HDR TRIP VLV
OPEN CLOSE
36 - A&B LTR CTRL
36 - C&D LTR CTRL
33 - A&B LTR CTRL
33 - C&D LTR CTRL
36 FULV CONTROL
33 FULV CONTROL
35 - A&B LTR CTRL
35 - C&D LTR CTRL
32 - A&B LTR CTRL
32 - C&D LTR CTRL
35 FULV CONTROL
32 FULV CONTROL
34 - A&B LTR CTRL
34 - C&D LTR CTRL
31 - A&B LTR CTRL
31 - C&D LTR CTRL
34 FULV CONTROL
31 FULV CONTROL
START STOP
VERIFY NO PURGE
STATUS
1.3
1.3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CUSTOM GRAPHIC
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PROCESS DIAGRAM
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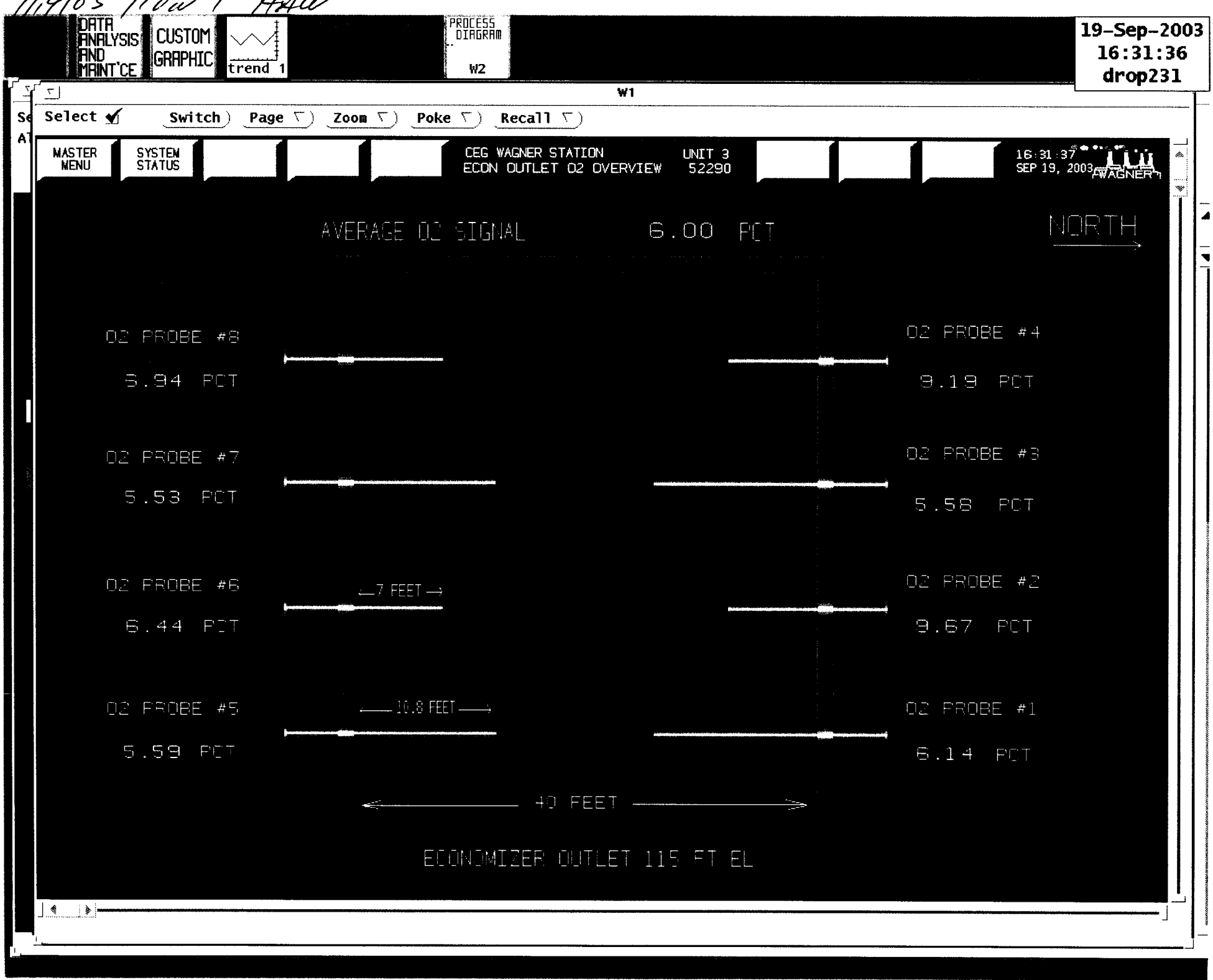
19-Sep-2003
16:31:47
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
CEG WAGNER STATION
SCR REACTOR SYSTEM
UNIT 3
52600
LDC
16:31:48
SEP 19, 2003
WAGNER
636.3
634.1
627.0
597.2
623.7
IN PURGE
CAL MODE
207.5
3275
254.3
3.1
-3.8
97.7
0.7
0.5
0.4
0.3
1.7
664
647
100.0
780
760
-0.1
2.1
100.6
549
543
-5.8
-6.1
0.7
604.6
598.8
590.4
598.1
30.8
6.6
INLET JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET
OUTLET DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET
BYPASS JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET
BYPASS SO DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET
SCR MODE SELECTION
IN SERV OUT OF SERV
CANCEL
SONIC HORN SEQ
ON
RUN STOP
HOLD RESUME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19-Sep-2003
16:31:36
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
CEG WAGNER STATION
ECON OUTLET O2 OVERVIEW
UNIT 3
52290
16:31:37
SEP 19, 2003
AVERAGE O2 SIGNAL
6.00 PCT
NORTH
O2 PROBE #8
5.94 PCT
O2 PROBE #4
9.19 PCT
O2 PROBE #7
5.53 PCT
O2 PROBE #3
5.58 PCT
O2 PROBE #6
6.44 PCT
7 FEET
O2 PROBE #2
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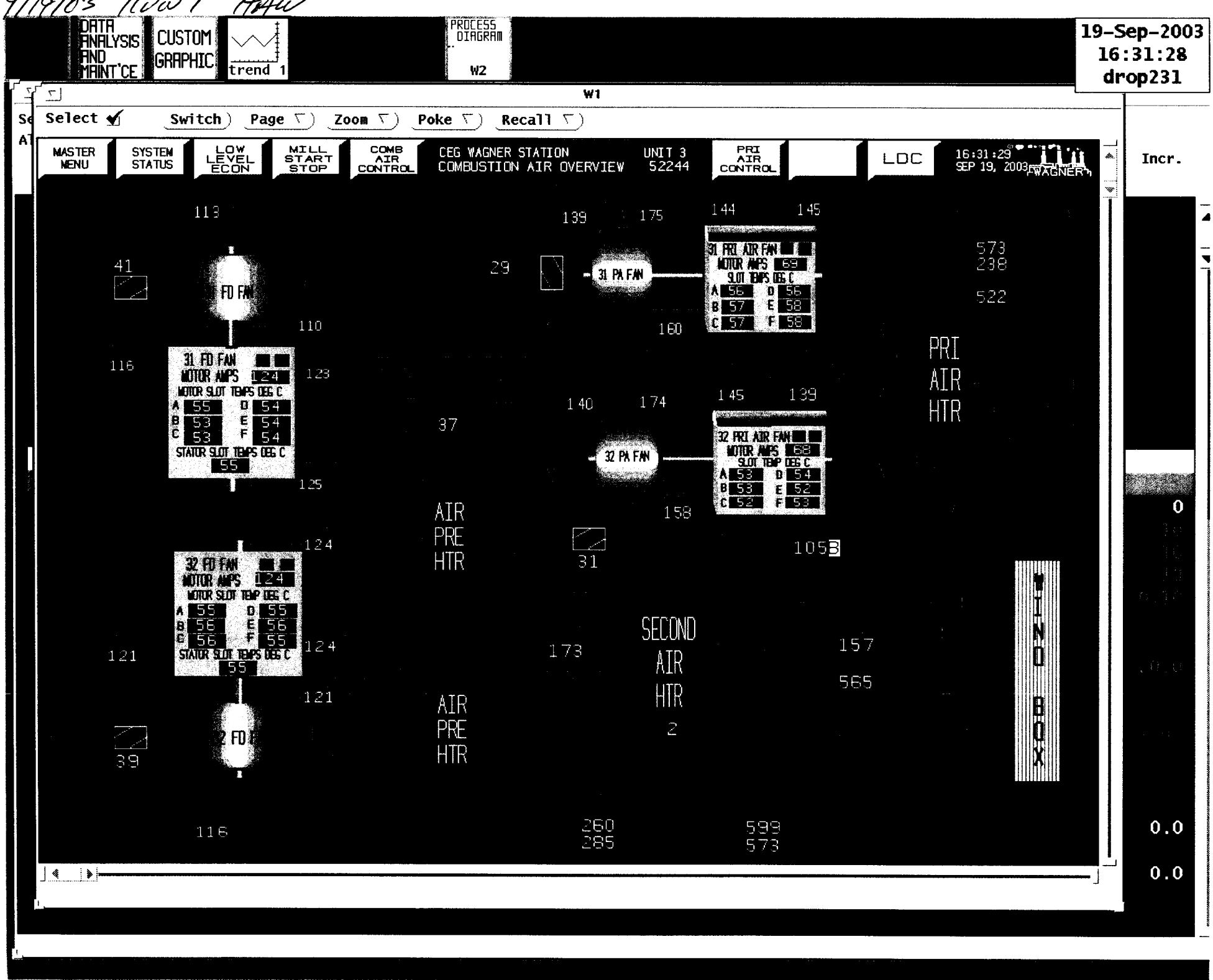
5.59 PCT
10.8 FEET
O2 PROBE #1
6.14 PCT
40 FEET
ECONOMIZER OUTLET 115 FT EL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CUSTOM GRAPHIC
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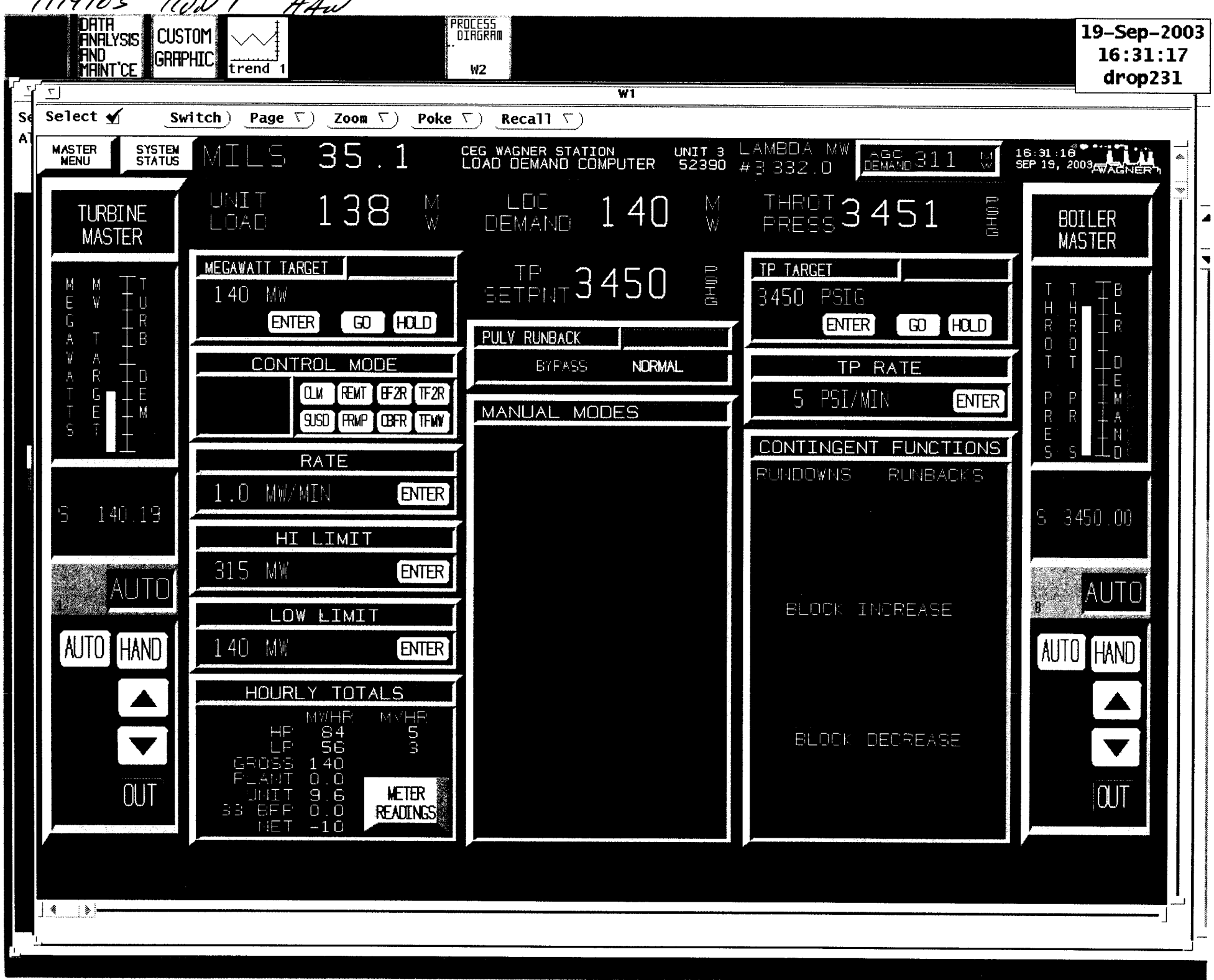
PROCESS DIAGRAM
W2
19-Sep-2003
16:31:28
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
LOW LEVEL ECON
MILL START STOP
COMB AIR CONTROL
CEG WAGNER STATION
COMBUSTION AIR OVERVIEW
UNIT 3
52244
PRI AIR CONTROL
LOC
16:31:29
SEP 19, 2003
FD FAN
31 FD FAN
MOTOR AMPS 124
MOTOR SLOT TEMPS DEG C
A 55 D 54
B 53 E 54
C 53 F 54
STATOR SLOT TEMPS DEG C
55
32 FD FAN
MOTOR AMPS 124
MOTOR SLOT TEMP DEG C
A 55 D 55
B 56 E 56
C 56 F 55
STATOR SLOT TEMPS DEG C
55
31 PA FAN
31 PRI AIR FAN
MOTOR AMPS 69
SLOT TEMPS DEG C
A 56 D 56
B 57 E 58
C 57 F 58
32 PA FAN
32 PRI AIR FAN
MOTOR AMPS 68
SLOT TEMP DEG C
A 53 D 54
B 53 E 52
C 52 F 53
PRI AIR HTR
AIR PRE HTR
SECOND AIR HTR
2
31
39
WIND BOX
Incr.
0
0.0
0.0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CUSTOM GRAPHIC
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PROCESS DIAGRAM
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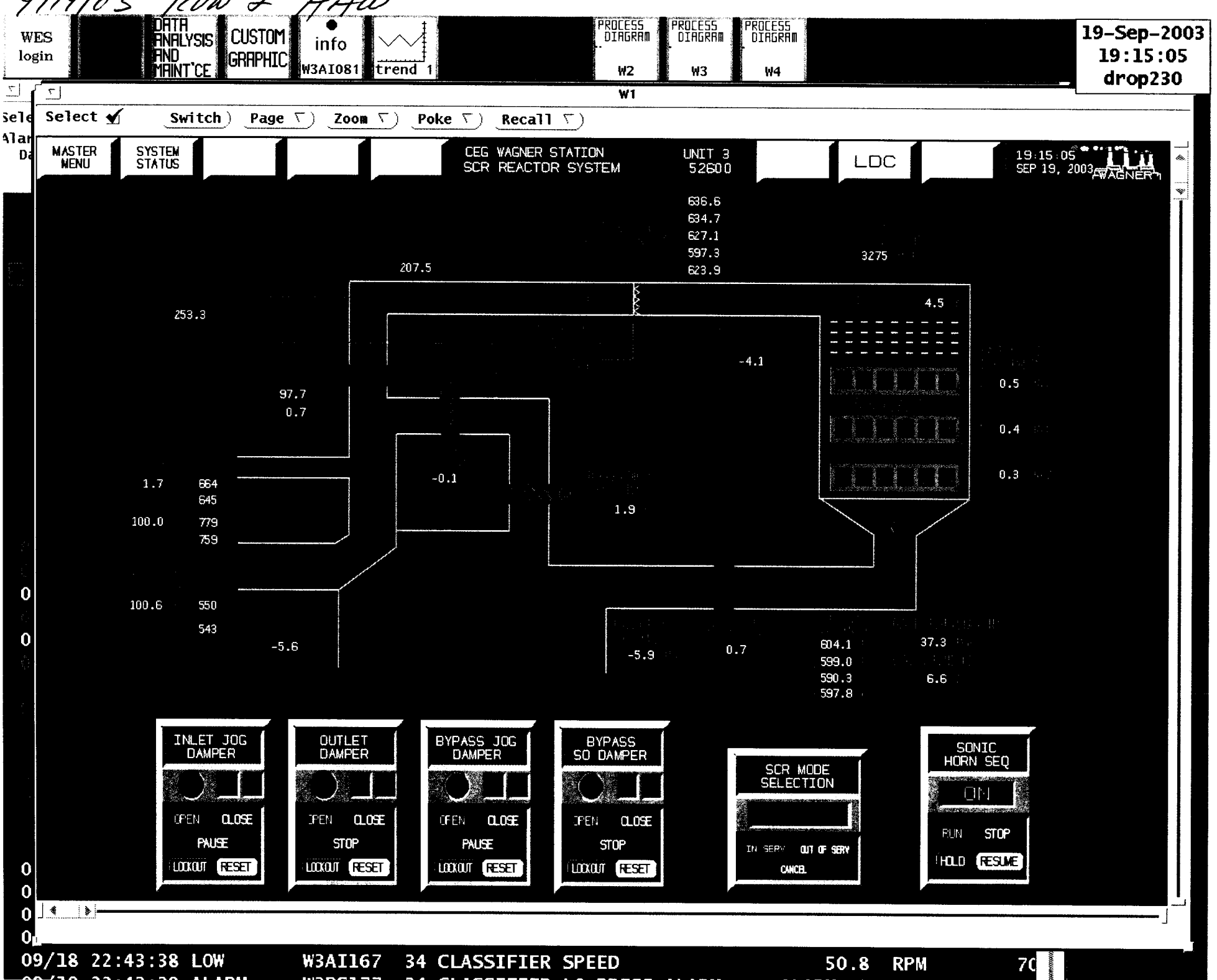
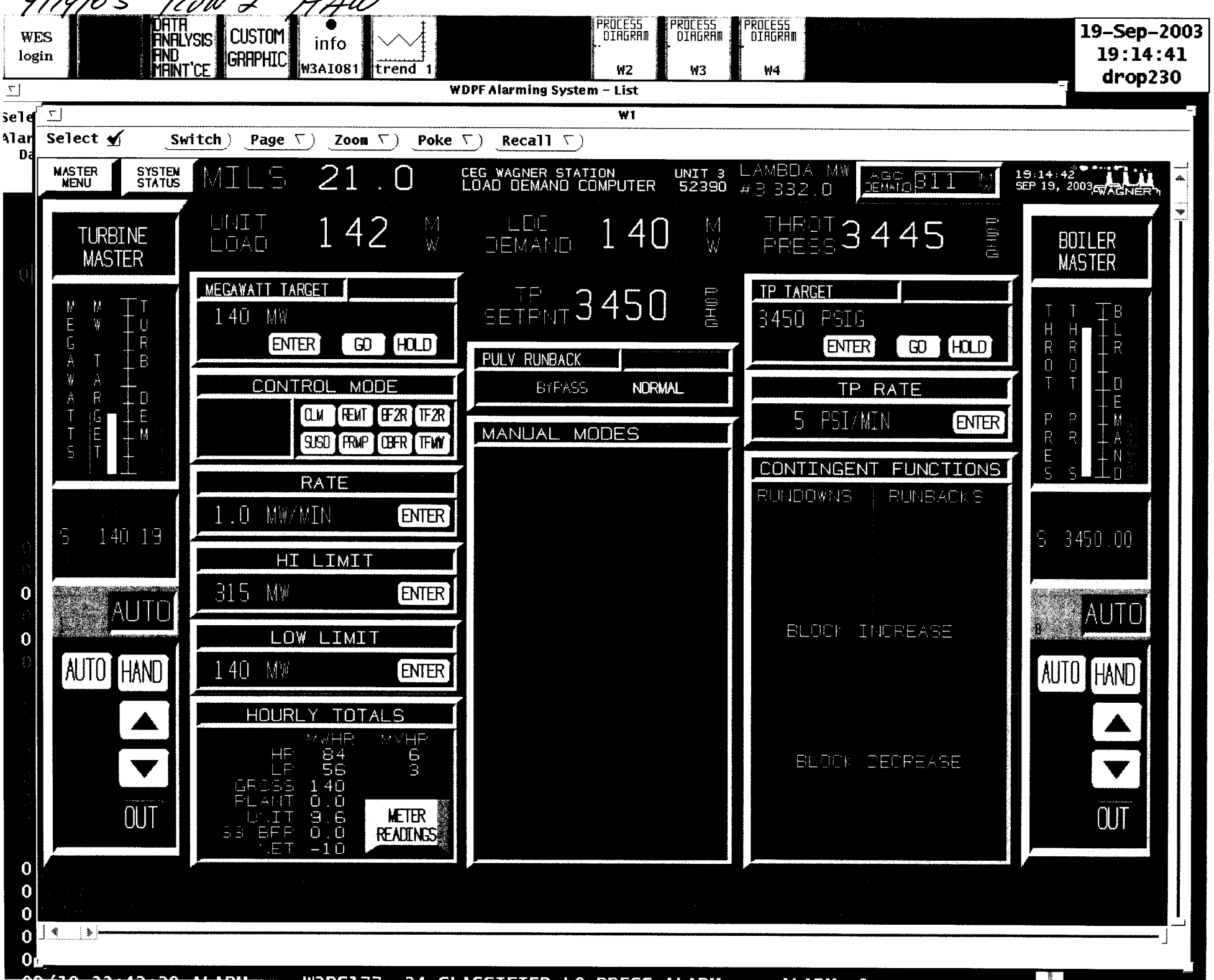
19-Sep-2003
16:31:17
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
MILS 35.1
CEG WAGNER STATION
LOAD DEMAND COMPUTER
UNIT 3
52390
LAMBDA MW
#3 332.0
AGC DEMAND 311 MW
16:31:16
SEP 19, 2003
WAGNER
TURBINE MASTER
UNIT LOAD 138 MW
LOC DEMAND 140 MW
THROT PRESS 3451 PSIG
TP SETPNT 3450 PSIG
MEGAWATT TARGET
140 MW
ENTER
GO
HOLD
CONTROL MODE
CLM
REMT
BF2R
TF2R
SUSD
PRMP
OBFR
TFMW
RATE
1.0 MW/MIN
ENTER
HI LIMIT
315 MW
ENTER
LOW LIMIT
140 MW
ENTER
HOURLY TOTALS
MWHR
MW/HR
HP 84 5
LP 56 3
GROSS 140
PLANT 0.0
UNIT 9.6
33 BFP 0.0
NET -10
METER READINGS
PULV RUNBACK
BYPASS
NORMAL
MANUAL MODES
TP TARGET
3450 PSIG
ENTER
GO
HOLD
TP RATE
5 PSI/MIN
ENTER
CONTINGENT FUNCTIONS
RUNDOWNS
RUNBACKS
BLOCK INCREASE
BLOCK DECREASE
BOILER MASTER
S 140.19
AUTO
AUTO
HAND
OUT
S 3450.00
AUTO
AUTO
HAND
OUT


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info W3AI081
trend 1
PROCESS DIAGRAM W2
PROCESS DIAGRAM W3
PROCESS DIAGRAM W4
19-Sep-2003 19:15:05 drop230
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
CEG WAGNER STATION
SCR REACTOR SYSTEM
UNIT 3
52600
LDC
19:15:05
SEP 19, 2003
WAGNER
636.6
634.7
627.1
597.3
623.9
207.5
3275
253.3
4.5
-4.1
97.7
0.7
0.5
0.4
0.3
1.7
664
645
100.0
779
759
-0.1
1.9
100.6
550
543
-5.6
-5.9
0.7
604.1
599.0
590.3
597.8
37.3
6.6
INLET JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET
OUTLET DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET
BYPASS JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET
BYPASS SO DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET
SCR MODE SELECTION
IN SERV OUT OF SERV
CANCEL
SONIC HORN SEQ
ON
RUN STOP
HOLD RESUME
09/18 22:43:38 LOW W3AI167 34 CLASSIFIER SPEED 50.8 RPM


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info W3AI081
trend 1
PROCESS DIAGRAM W2
PROCESS DIAGRAM W3
PROCESS DIAGRAM W4
19-Sep-2003 19:14:41 drop230
WDPF Alarming System - List
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
MILS 21.0
CEG WAGNER STATION LOAD DEMAND COMPUTER
UNIT 3 52390
LAMBDA MW #3 332.0
AGC DEMAND 811 MW
19:14:42 SEP 19, 2003
WAGNER
TURBINE MASTER
UNIT LOAD 142 MW
LOC DEMAND 140 MW
THROT PRESS 3445 PSIG
MEGAWATT TARGET
140 MW
ENTER GO HOLD
TP SETPNT 3450 PSIG
PULV RUNBACK
BYPASS NORMAL
CONTROL MODE
CLM REMT BF2R TF2R
SUSD PRMP CBFR TFMW
MANUAL MODES
RATE
1.0 MW/MIN ENTER
HI LIMIT
315 MW ENTER
LOW LIMIT
140 MW ENTER
HOURLY TOTALS
MWHR MWHR
HP 84 6
LP 56 3
GROSS 140
PLANT 0.0
UNIT 9.6
BFP 0.0
NET -10
METER READINGS
TP TARGET
3450 PSIG
ENTER GO HOLD
TP RATE
5 PSI/MIN ENTER
CONTINGENT FUNCTIONS
RUNDOWNS RUNBACKS
BLOCK INCREASE
BLOCK DECREASE
BOILER MASTER
S 140 19
S 3450.00
AUTO
AUTO HAND
OUT
AUTO
AUTO HAND
OUT

9/19/03 flow 2 HAW

WES login | DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | info W3AI081 | trend 1 | PROCESS DIAGRAM W2 | PROCESS DIAGRAM W3 | PROCESS DIAGRAM W4

19-Sep-2003
19:15:16
drop230

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS

CEG WAGNER STATION UNIT 3
ECON OUTLET O2 OVERVIEW 52290

19:15:17
SEP 19, 2003

WAGNER

AVERAGE O2 SIGNAL 5.70 PCT

NORTH

O2 PROBE #8
5.64 PCT

O2 PROBE #4
9.68 PCT

O2 PROBE #7
5.32 PCT

O2 PROBE #3
5.82 PCT

O2 PROBE #6
5.92 PCT

7 FEET

O2 PROBE #2
8.31 PCT

O2 PROBE #5
4.62 PCT

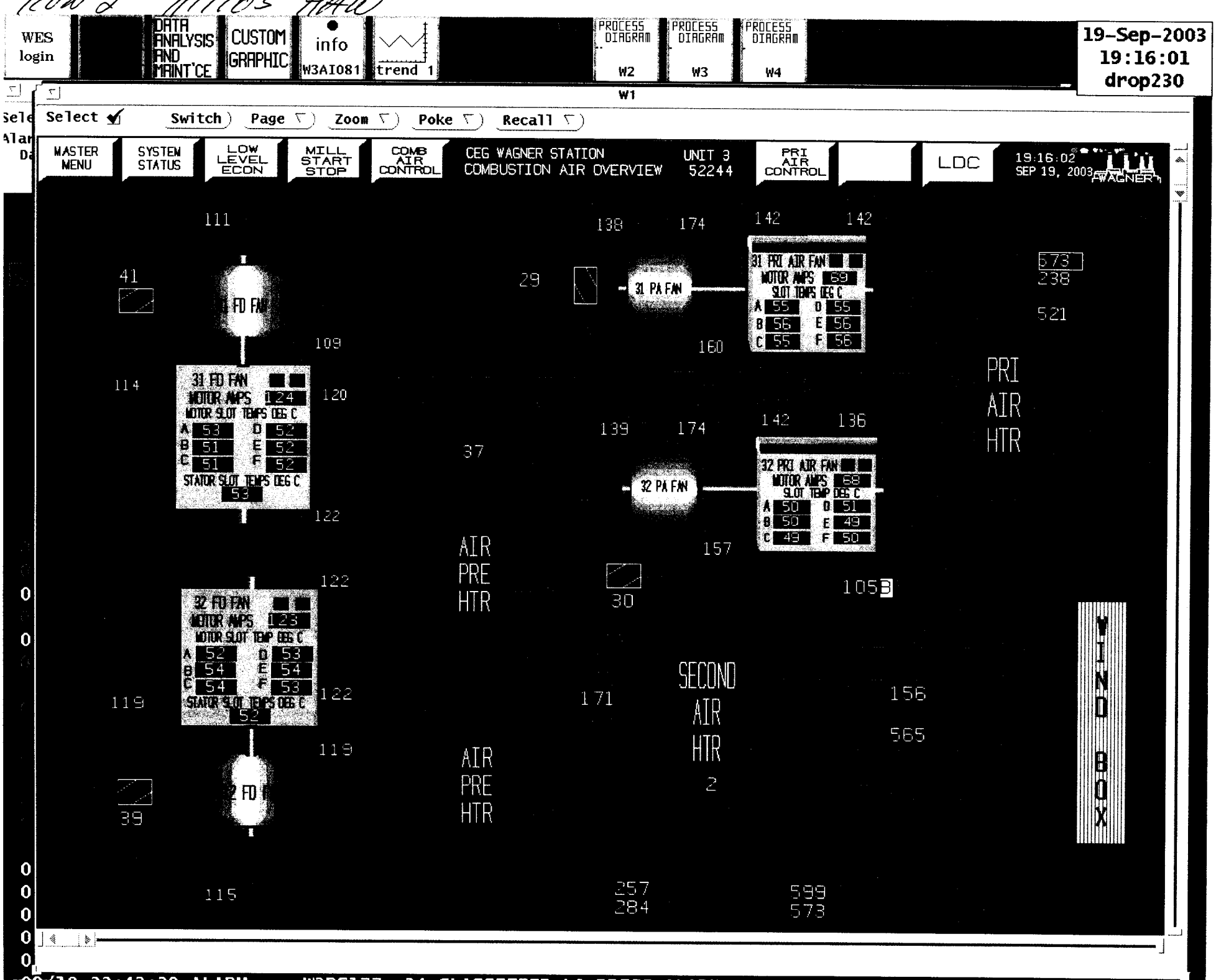
10.8 FEET

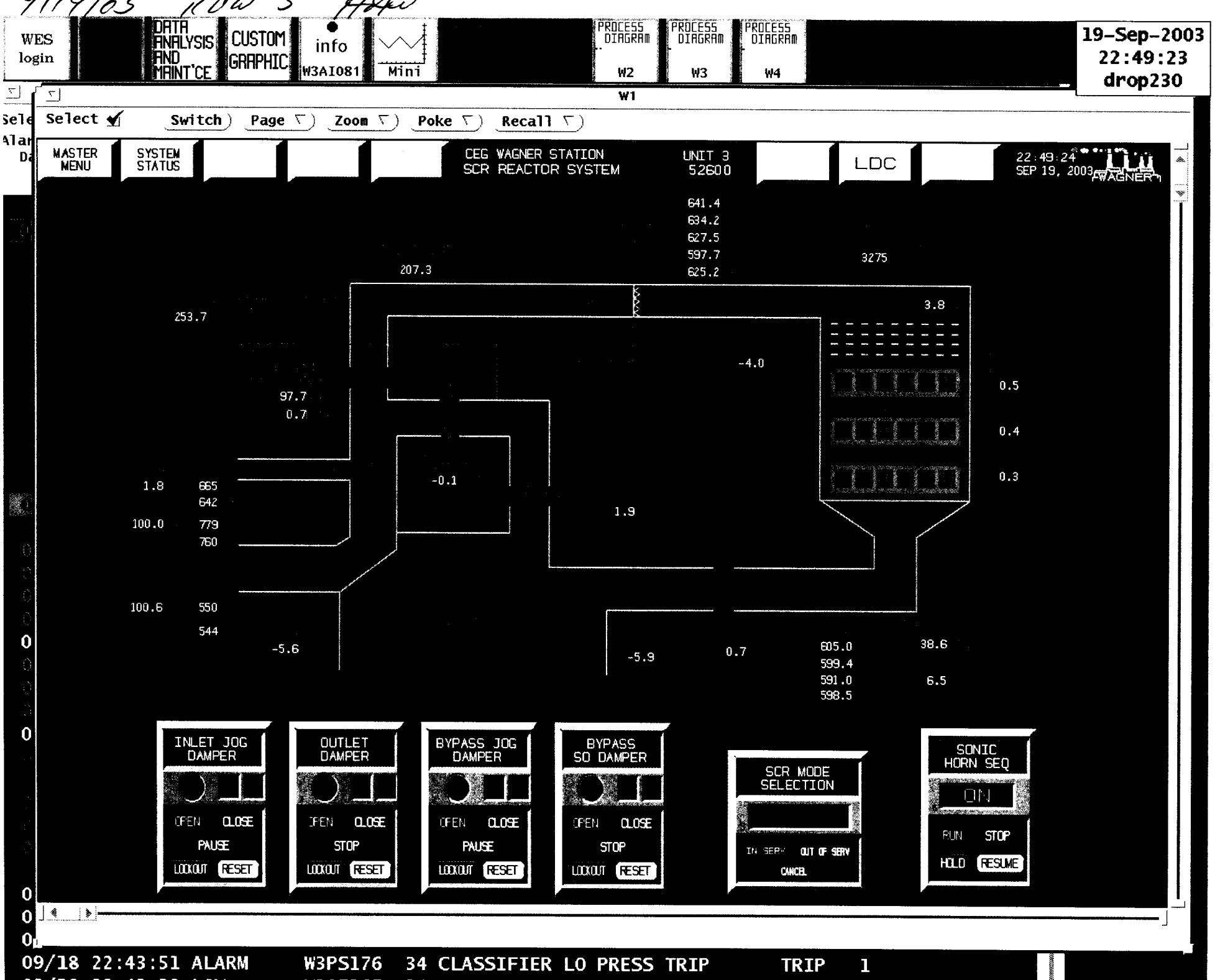
O2 PROBE #1
6.45 PCT

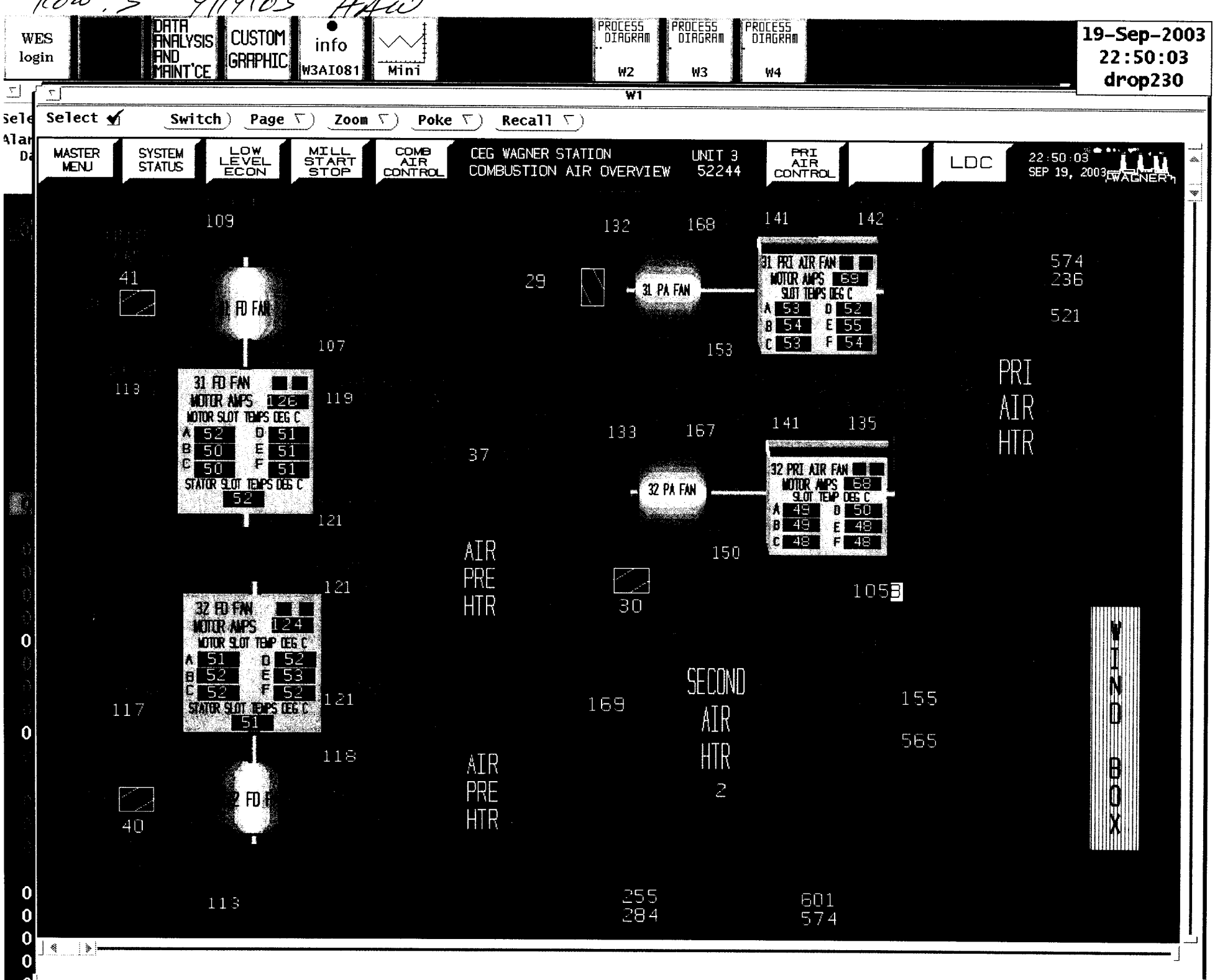
40 FEET

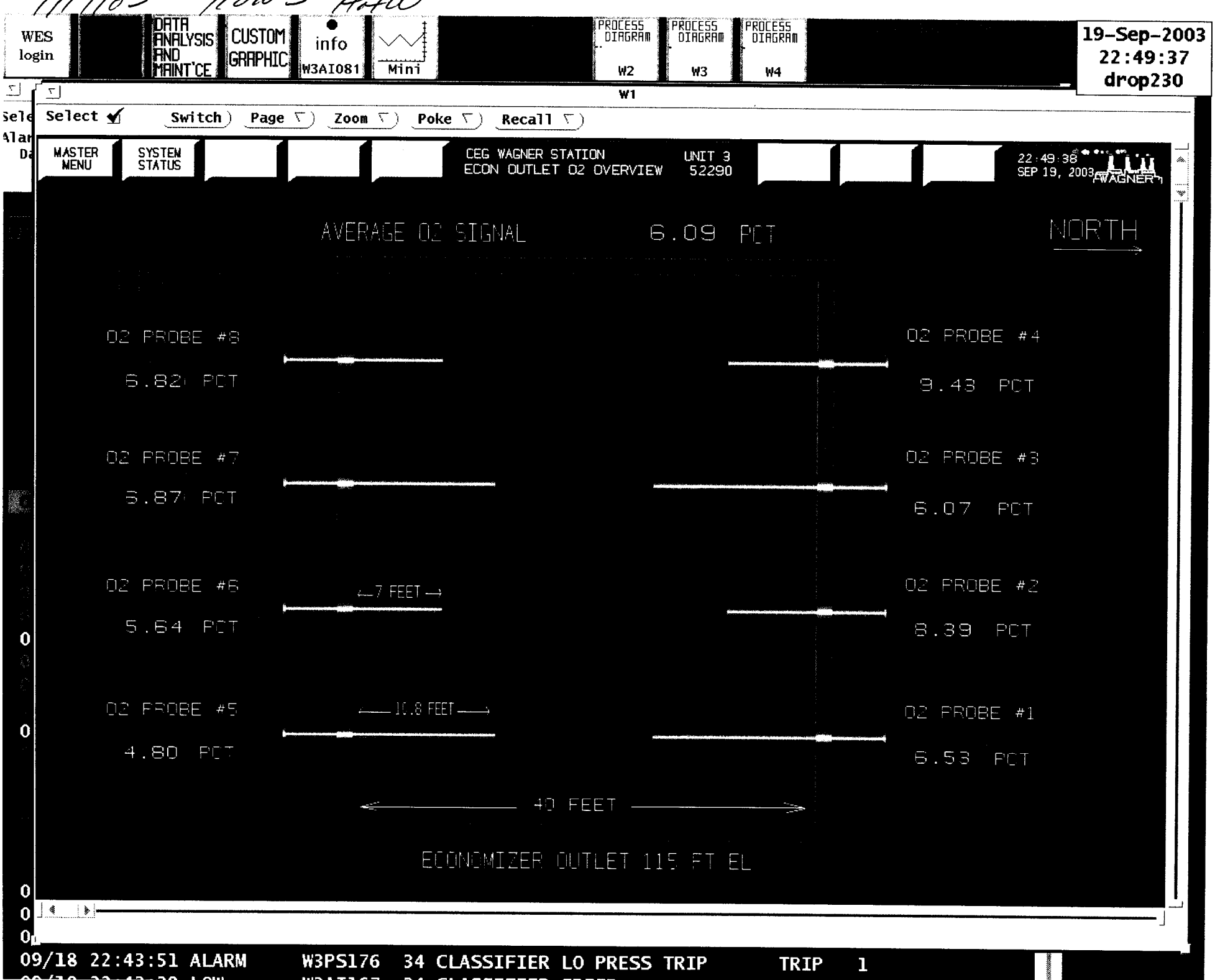
ECONOMIZER OUTLET 115 FT EL

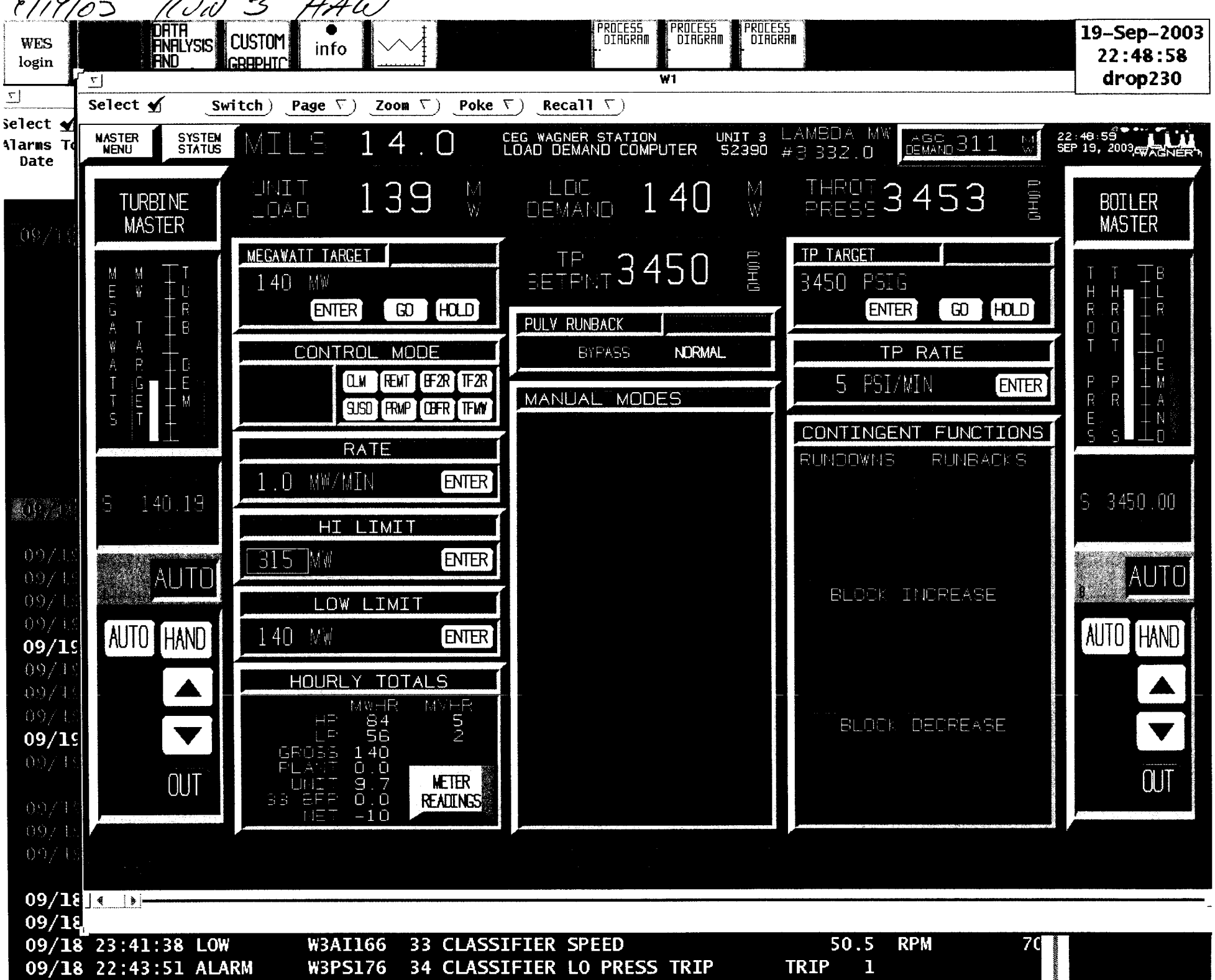
09/18 22:43:38 LOW W3AI167 34 CLASSIFIER SPEED 50.8 RPM 7C


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info W3AI081
trend 1
PROCESS DIAGRAM W2
PROCESS DIAGRAM W3
PROCESS DIAGRAM W4
19-Sep-2003 19:16:01 drop230
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
LOW LEVEL ECON
MILL START STOP
COMB AIR CONTROL
CEG WAGNER STATION
COMBUSTION AIR OVERVIEW
UNIT 3
52244
PRI AIR CONTROL
LDC
19:16:02
SEP 19, 2003
WAGNER
31 FD FAN
MOTOR AMPS 124
MOTOR SLOT TEMPS DEG C
A 53 D 52
B 51 E 52
C 51 F 52
STATOR SLOT TEMPS DEG C
53
32 FD FAN
MOTOR AMPS 123
MOTOR SLOT TEMP DEG C
A 52 D 53
B 54 E 54
C 54 F 53
STATOR SLOT TEMPS DEG C
52
31 PA FAN
32 PA FAN
31 PRI AIR FAN
MOTOR AMPS 69
SLOT TEMPS DEG C
A 55 D 55
B 56 E 56
C 55 F 56
32 PRI AIR FAN
MOTOR AMPS 68
SLOT TEMP DEG C
A 50 D 51
B 50 E 49
C 49 F 50
PRI AIR HTR
AIR PRE HTR
SECOND AIR HTR
WIND BOX


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info
W3AI081
Mini
PROCESS DIAGRAM W2
PROCESS DIAGRAM W3
PROCESS DIAGRAM W4
19-Sep-2003
22:49:23
drop230
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
CEG WAGNER STATION
SCR REACTOR SYSTEM
UNIT 3
52600
LDC
22:49:24
SEP 19, 2003
WAGNER
641.4
634.2
627.5
597.7
625.2
3275
207.3
253.7
3.8
-4.0
97.7
0.7
0.5
0.4
0.3
1.8
865
642
-0.1
1.9
100.0
779
760
100.6
550
544
-5.6
-5.9
0.7
605.0
599.4
591.0
598.5
38.6
6.5
INLET JOG DAMPER
OUTLET DAMPER
BYPASS JOG DAMPER
BYPASS SO DAMPER
OPEN CLOSE
PAUSE
STOP
LOCKOUT RESET
SCR MODE SELECTION
IN SERV OUT OF SERV
CANCEL
SONIC HORN SEQ
ON
RUN STOP
HOLD RESUME
09/18 22:43:51 ALARM W3PS176 34 CLASSIFIER LO PRESS TRIP TRIP 1


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info
W3AI081
Mini
PROCESS DIAGRAM
W2
PROCESS DIAGRAM
W3
PROCESS DIAGRAM
W4
19-Sep-2003
22:50:03
drop230
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
LOW LEVEL ECON
MILL START STOP
COMB AIR CONTROL
CEG WAGNER STATION
UNIT 3
COMBUSTION AIR OVERVIEW
52244
PRI AIR CONTROL
LDC
22:50:03
SEP 19, 2003
WAGNER
109
41
FD FAN
107
113
31 FD FAN
MOTOR AMPS 128
MOTOR SLOT TEMPS DEG C
A 52 D 51
B 50 E 51
C 50 F 51
STATOR SLOT TEMPS DEG C
52
119
121
121
32 FD FAN
MOTOR AMPS 124
MOTOR SLOT TEMP DEG C
A 51 D 52
B 52 E 53
C 52 F 52
STATOR SLOT TEMPS DEG C
51
117
121
118
40
132
168
29
31 PA FAN
141
142
31 PRI AIR FAN
MOTOR AMPS 69
SLOT TEMPS DEG C
A 53 D 52
B 54 E 55
C 53 F 54
153
574
236
521
PRI AIR HTR
133
167
37
32 PA FAN
141
135
32 PRI AIR FAN
MOTOR AMPS 88
SLOT TEMP DEG C
A 49 B 50
B 49 E 48
C 48 F 48
150
AIR PRE HTR
30
1053
WIND BOX
SECOND AIR HTR 2
169
155
565
AIR PRE HTR
113
255
284
601
574


WES login
DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
info
W3AI081
Mini
PROCESS DIAGRAM W2
PROCESS DIAGRAM W3
PROCESS DIAGRAM W4
19-Sep-2003 22:49:37 drop230
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
CEG WAGNER STATION UNIT 3
ECON OUTLET O2 OVERVIEW 52290
22:49:38 SEP 19, 2003
WAGNER
AVERAGE O2 SIGNAL 6.09 PCT
NORTH
O2 PROBE #8
6.82 PCT
O2 PROBE #4
9.43 PCT
O2 PROBE #7
6.87 PCT
O2 PROBE #3
6.07 PCT
O2 PROBE #6
5.64 PCT
7 FEET
O2 PROBE #2
8.39 PCT
O2 PROBE #5
4.80 PCT
10.8 FEET
O2 PROBE #1
6.53 PCT
40 FEET
ECONOMIZER OUTLET 115 FT EL
09/18 22:43:51 ALARM W3PS176 34 CLASSIFIER LO PRESS TRIP TRIP 1



09/18 23:41:38 LOW W3AI166 33 CLASSIFIER SPEED 50.5 RPM 70
09/18 22:43:51 ALARM W3PS176 34 CLASSIFIER LO PRESS TRIP TRIP 1

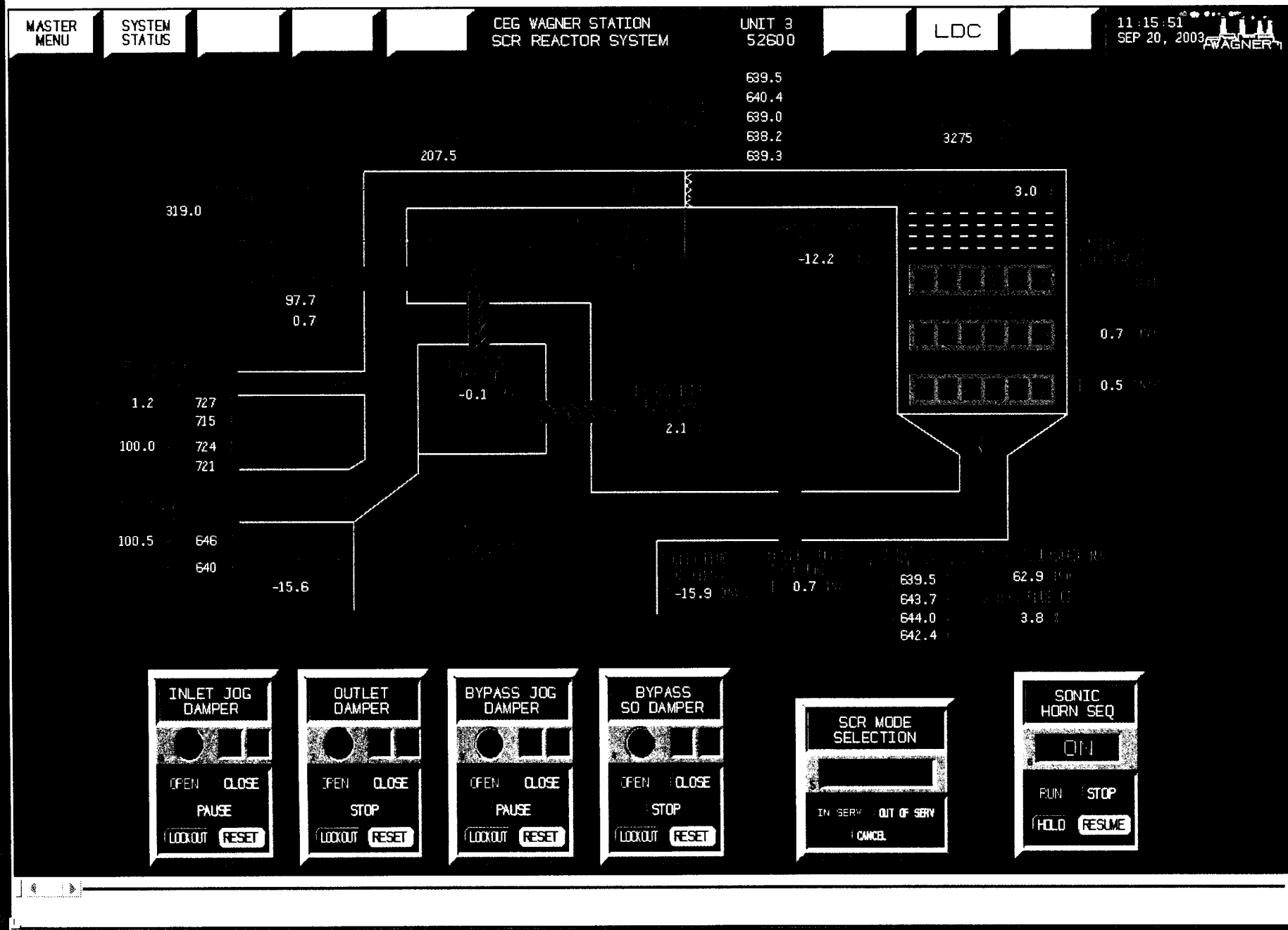
AAW3 9/20/03 Run 1

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2

20-Sep-2003
11:15:50
drop231

W1

Select | Switch | Page | Zoom | Poke | Recall



HAD'S 9/20/03 11:00 AM

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2

20-Sep-2003
11:15:59
drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS

CEG WAGNER STATION UNIT 3
ECON OUTLET O2 OVERVIEW 52290

11:15:59
SEP 20, 2003

WAGNER

AVERAGE O2 SIGNAL 3.16 PCT

NORTH

O2 PROBE #8
3.15 PCT

O2 PROBE #4
9.47 PCT

O2 PROBE #7
2.67 PCT

O2 PROBE #3
3.95 PCT

O2 PROBE #6
2.72 PCT

7 FEET

O2 PROBE #2
8.49 PCT

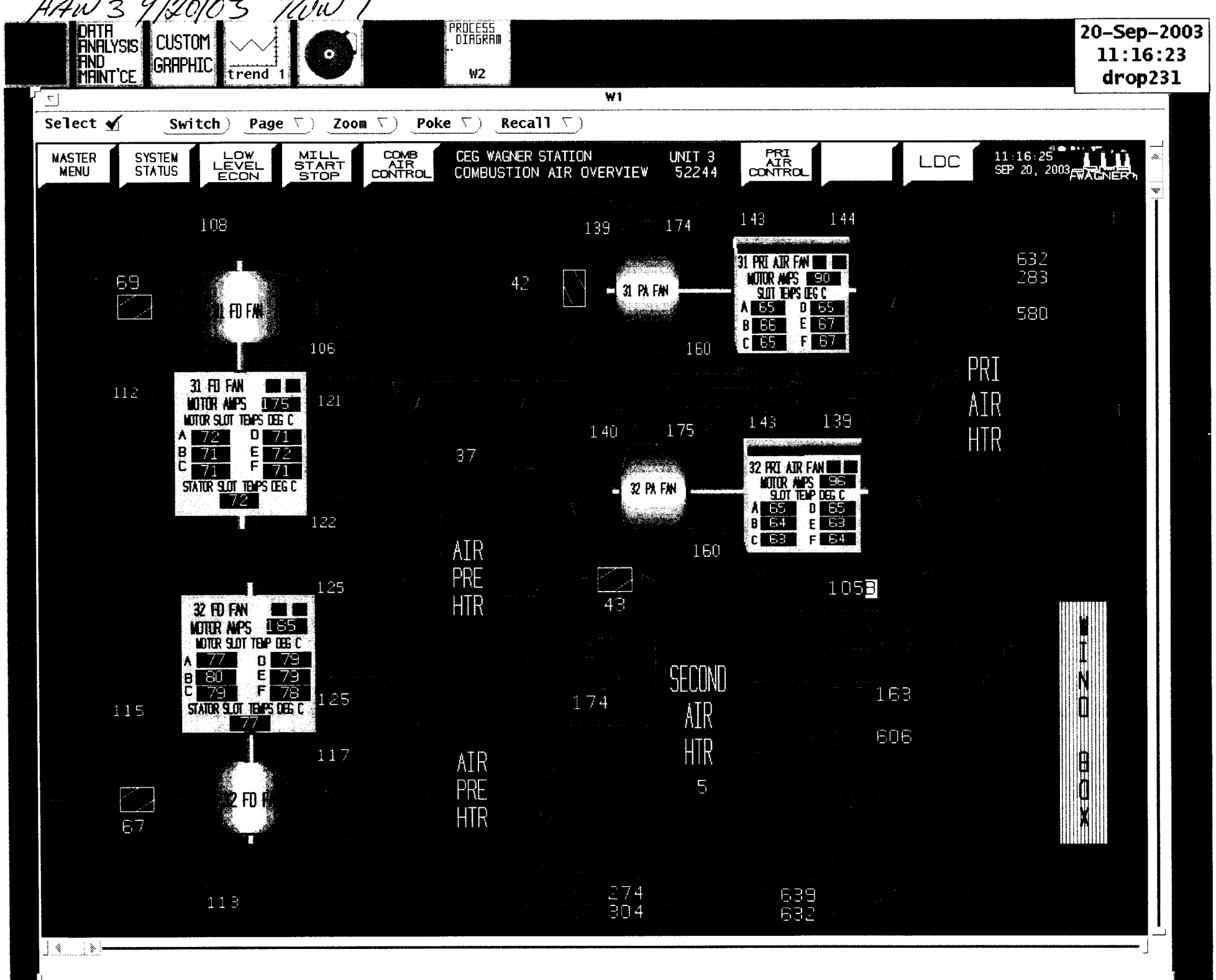
O2 PROBE #5
3.34 PCT

11.8 FEET

O2 PROBE #1
5.94 PCT

40 FEET

ECONOMIZER OUTLET 115 FT EL


DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
trend 1
PROCESS DIAGRAM
W2
20-Sep-2003
11:16:23
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
LOW LEVEL ECON
MILL START STOP
COMB AIR CONTROL
CEG WAGNER STATION
COMBUSTION AIR OVERVIEW
UNIT 3
52244
PRI AIR CONTROL
LDC
11:16:25
SEP 20, 2003
FWAGNER
31 FD FAN
31 FD FAN
MOTOR AMPS 175
MOTOR SLOT TEMPS DEG C
A 72 D 71
B 71 E 72
C 71 F 71
STATOR SLOT TEMPS DEG C
72
31 PA FAN
31 PRI AIR FAN
MOTOR AMPS 90
SLOT TEMPS DEG C
A 65 D 65
B 66 E 67
C 65 F 67
32 PA FAN
32 PRI AIR FAN
MOTOR AMPS 96
SLOT TEMP DEG C
A 65 D 65
B 64 E 63
C 63 F 64
32 FD FAN
MOTOR AMPS 185
MOTOR SLOT TEMP DEG C
A 77 D 79
B 80 E 79
C 79 F 78
STATOR SLOT TEMPS DEG C
77
PRI AIR HTR
AIR PRE HTR
SECOND AIR HTR
AIR PRE HTR
H2O BOX

HAW's 9/20/03 10:07

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2

20-Sep-2003
11:15:30
drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS | MILS 23.3 | CEG WAGNER STATION LOAD DEMAND COMPUTER | UNIT 3 52390 | LAMBDA MW #3 332.0 | AGC DEMAND 311 MW | 11:15:32 SEP 20, 2003 | WAGNER

TURBINE MASTER

MEGAWATTS TURBINE MASTER

S 305.31

AUTO

AUTO | HAND

OUT

UNIT LOAD 306 MW

LOC DEMAND 305 MW

THROT PRESS 3449 PSIG

TP SETPNT 3450 PSIG

MEGAWATT TARGET
310 MW
ENTER | GO | HOLD

CONTROL MODE
CLM | REMT | BF2R | TF2R
SUSD | PRMP | CBFR | TFMW

RATE
1.0 MW/MIN ENTER

HI LIMIT
315 MW ENTER

LOW LIMIT
140 MW ENTER

HOURLY TOTALS

	MWHR	MVARHR
HP	178	23
LP	127	18
GROSS	305	
E_OUT	0.0	
UNIT	14.3	
BFP	0.0	
NET	-14	

METER READINGS

PULV RUNBACK
BYPASS NORMAL

MANUAL MODES

TP TARGET
3450 PSIG
ENTER | GO | HOLD

TP RATE
5 PSI/MIN ENTER

CONTINGENT FUNCTIONS
RUNDOWNS | RUNBACKS
BLOCK INCREASE
BLOCK DECREASE

BOILER MASTER

THROT PRESS BOILER DEMAND

S 3450.00

8 AUTO

AUTO | HAND

OUT

HAI03/20103 Item 2

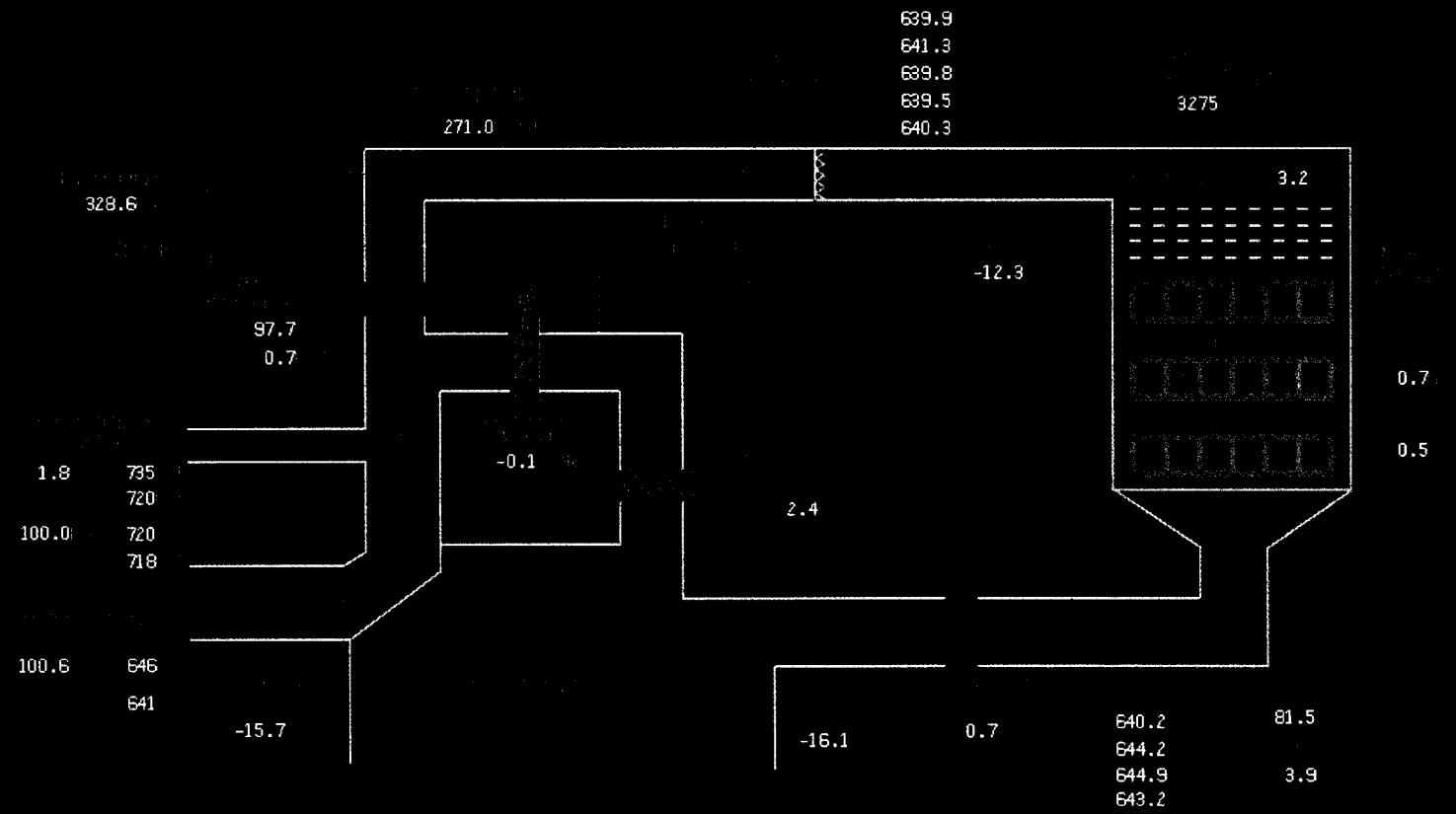
DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM .. W2

20-Sep-2003
13:27:54
drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS | CEG WAGNER STATION | SCR REACTOR SYSTEM | UNIT 3 | 52600 | LDC | 13:27:55 SEP 20, 2003 | WAGNER



INLET JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET

OUTLET DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET

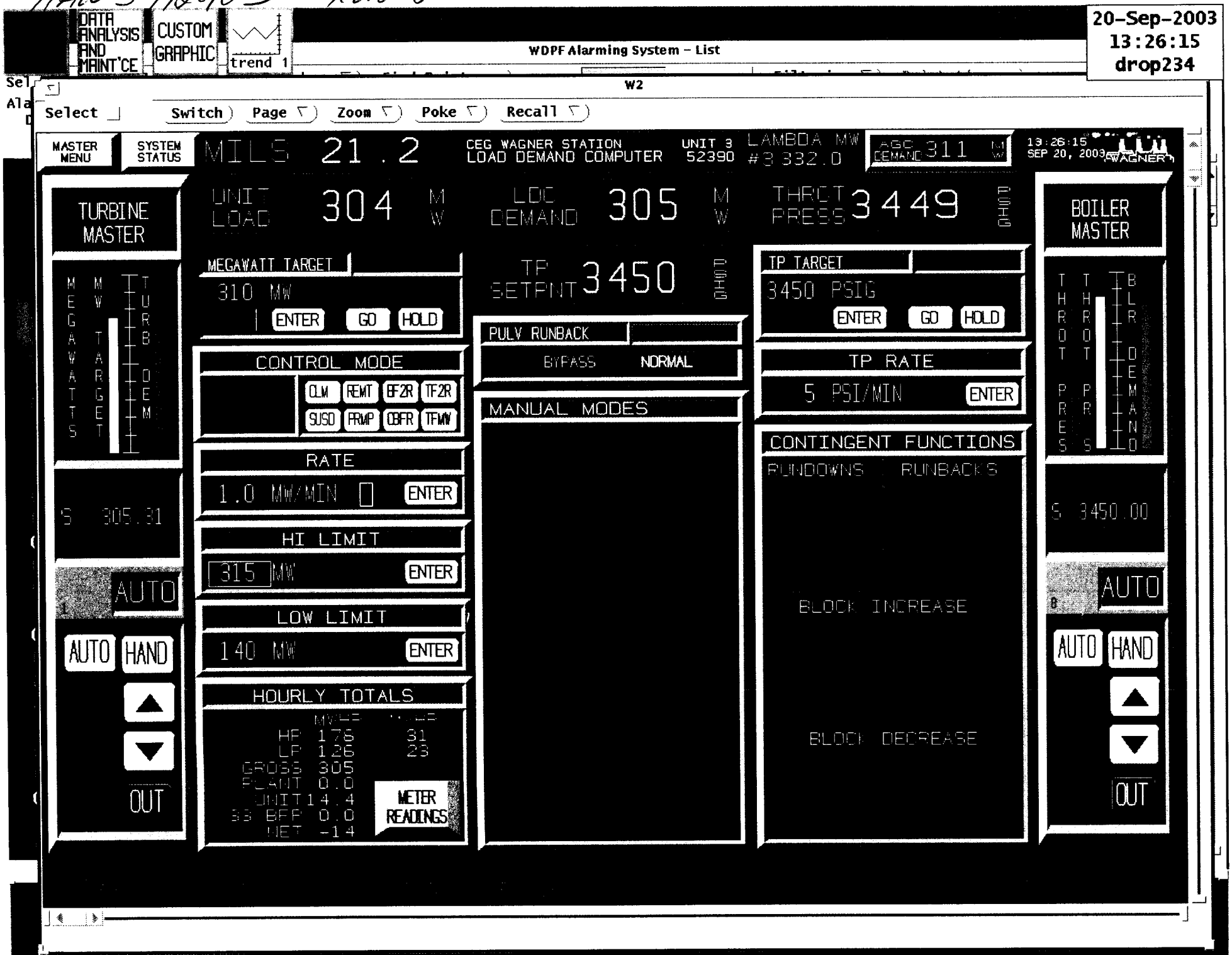
BYPASS JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET

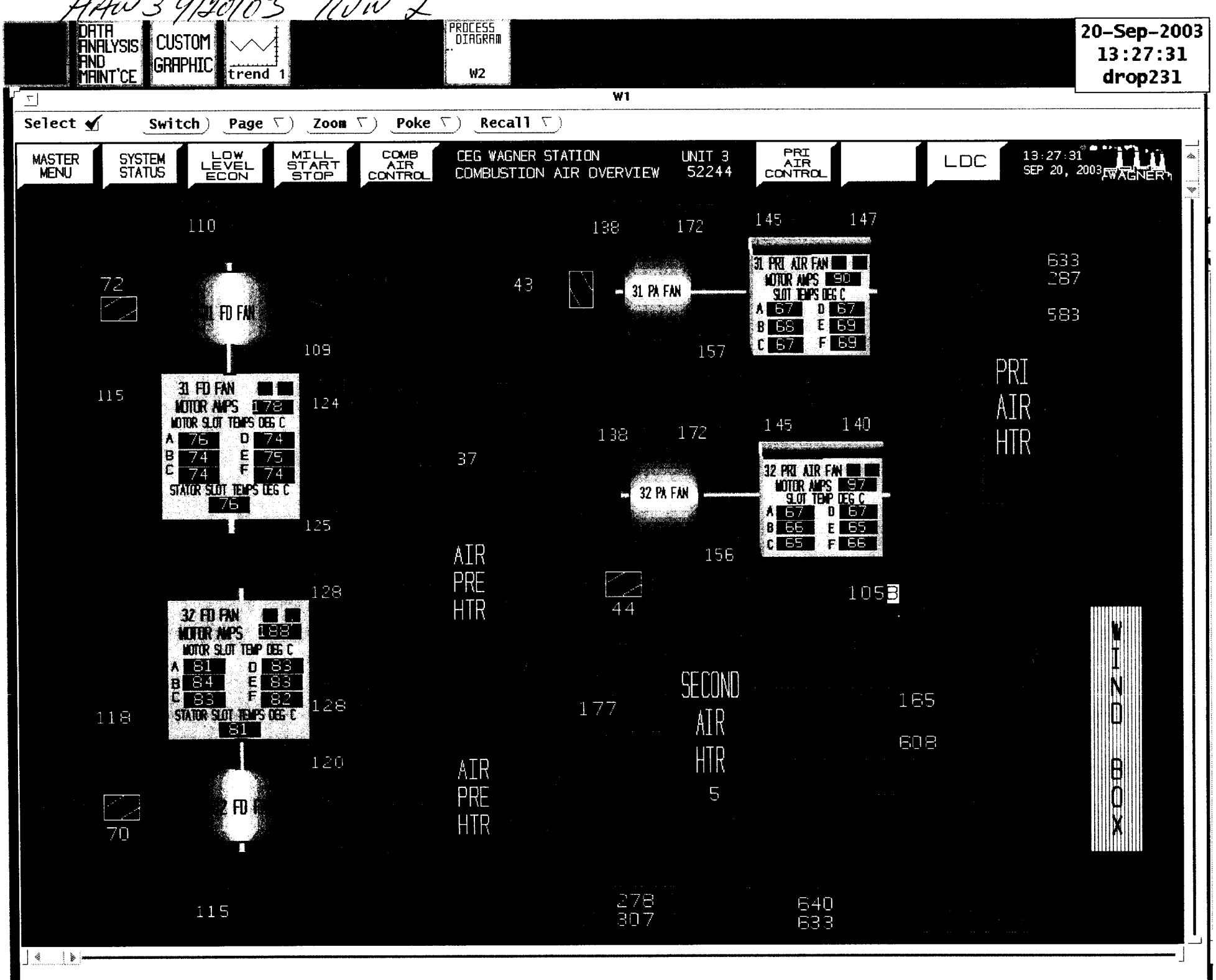
BYPASS SO DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET

SCR MODE SELECTION
IN SERV OUT OF SERV
CANCEL

SONIC HORN SEQ
ON
RUN STOP
HOLD RESUME

HAU3 9/20/03 Run 2




DATA ANALYSIS AND MAINT'CE
CUSTOM GRAPHIC
trend 1
PROCESS DIAGRAM
W2
20-Sep-2003
13:27:31
drop231
W1
Select
Switch
Page
Zoom
Poke
Recall
MASTER MENU
SYSTEM STATUS
LOW LEVEL ECON
MILL START STOP
COMB AIR CONTROL
CEG WAGNER STATION
COMBUSTION AIR OVERVIEW
UNIT 3
52244
PRI AIR CONTROL
LDC
13:27:31
SEP 20, 2003
WAGNER
31 FD FAN
MOTOR AMPS 178
MOTOR SLOT TEMPS DEG C
A 76 D 74
B 74 E 75
C 74 F 74
STATOR SLOT TEMPS DEG C
76
32 FD FAN
MOTOR AMPS 188
MOTOR SLOT TEMP DEG C
A 81 D 83
B 84 E 83
C 83 F 82
STATOR SLOT TEMPS DEG C
81
31 PA FAN
31 PRI AIR FAN
MOTOR AMPS 90
SLOT TEMPS DEG C
A 67 D 67
B 68 E 69
C 67 F 69
32 PA FAN
32 PRI AIR FAN
MOTOR AMPS 97
SLOT TEMP DEG C
A 67 D 67
B 66 E 65
C 65 F 66
PRI AIR HTR
AIR PRE HTR
SECOND AIR HTR
AIR PRE HTR
WIND BOX

AAU3 9/20/03 Row 2

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2

20-Sep-2003
13:27:42
drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS

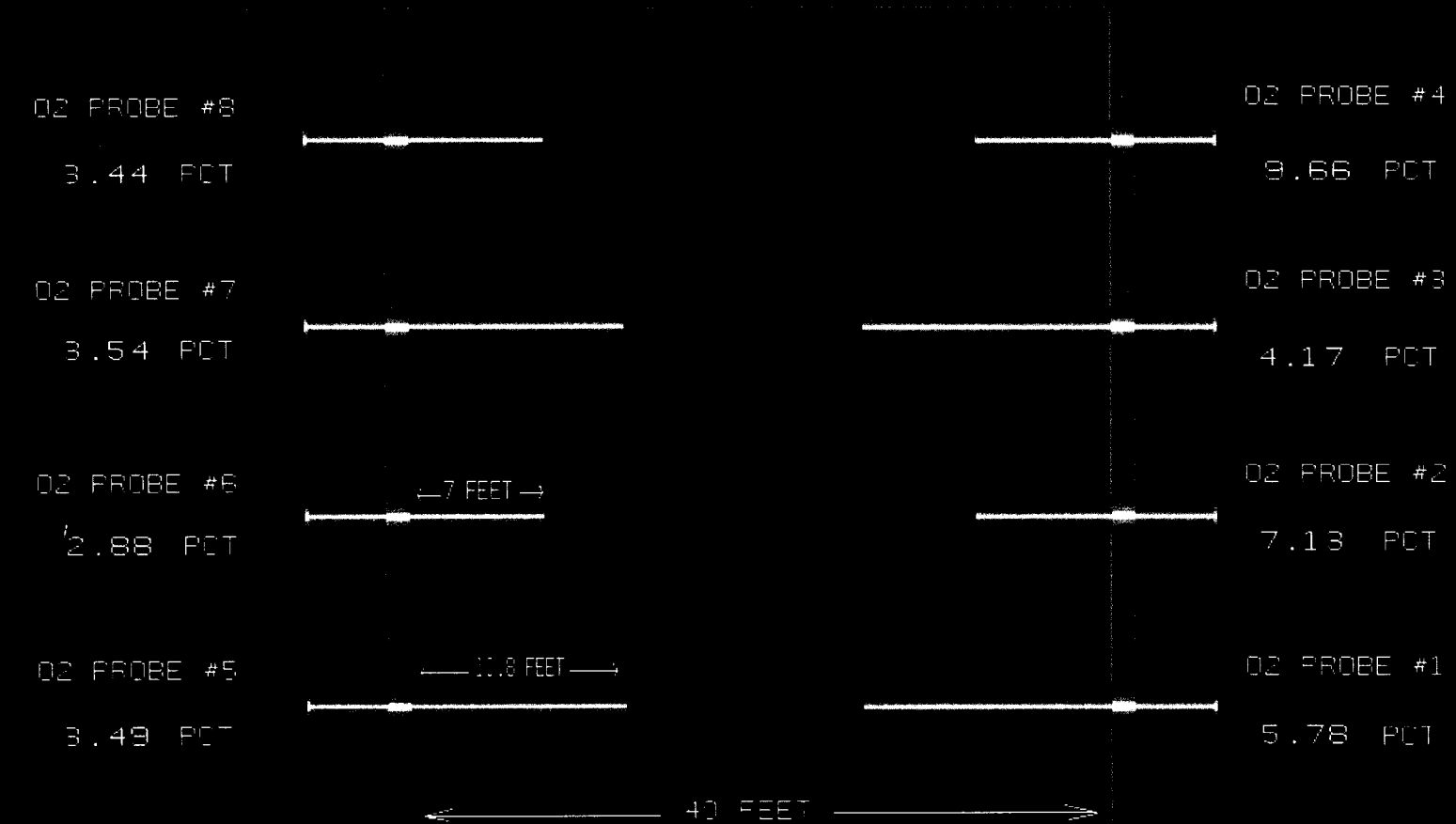
CEG WAGNER STATION UNIT 3
ECON OUTLET O2 OVERVIEW 52290

13:27:43
SEP 20, 2003

WAGNER

AVERAGE O2 SIGNAL 3.53 PCT

NORTH



ECONOMIZER OUTLET 115 FT EL

FIRW UNIT 3 12003

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2 | 20-Sep-2003 16:21:28 drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS | CEG WAGNER STATION SCR REACTOR SYSTEM | UNIT 3 52600 | LDC | 16:21:28 SEP 20, 2003 WAGNER

621.9
623.9
623.0
623.8
623.1

3275

251.7

3.3

328.5

-8.9

97.7
0.7

0.6

0.4

29.2 754
753

-0.1

2.9

100.0 709
712

100.6 621
617

-11.6

-11.9

0.7

627.2
632.2
632.8
630.5

10.9

3.9

INLET JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET

OUTLET DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET

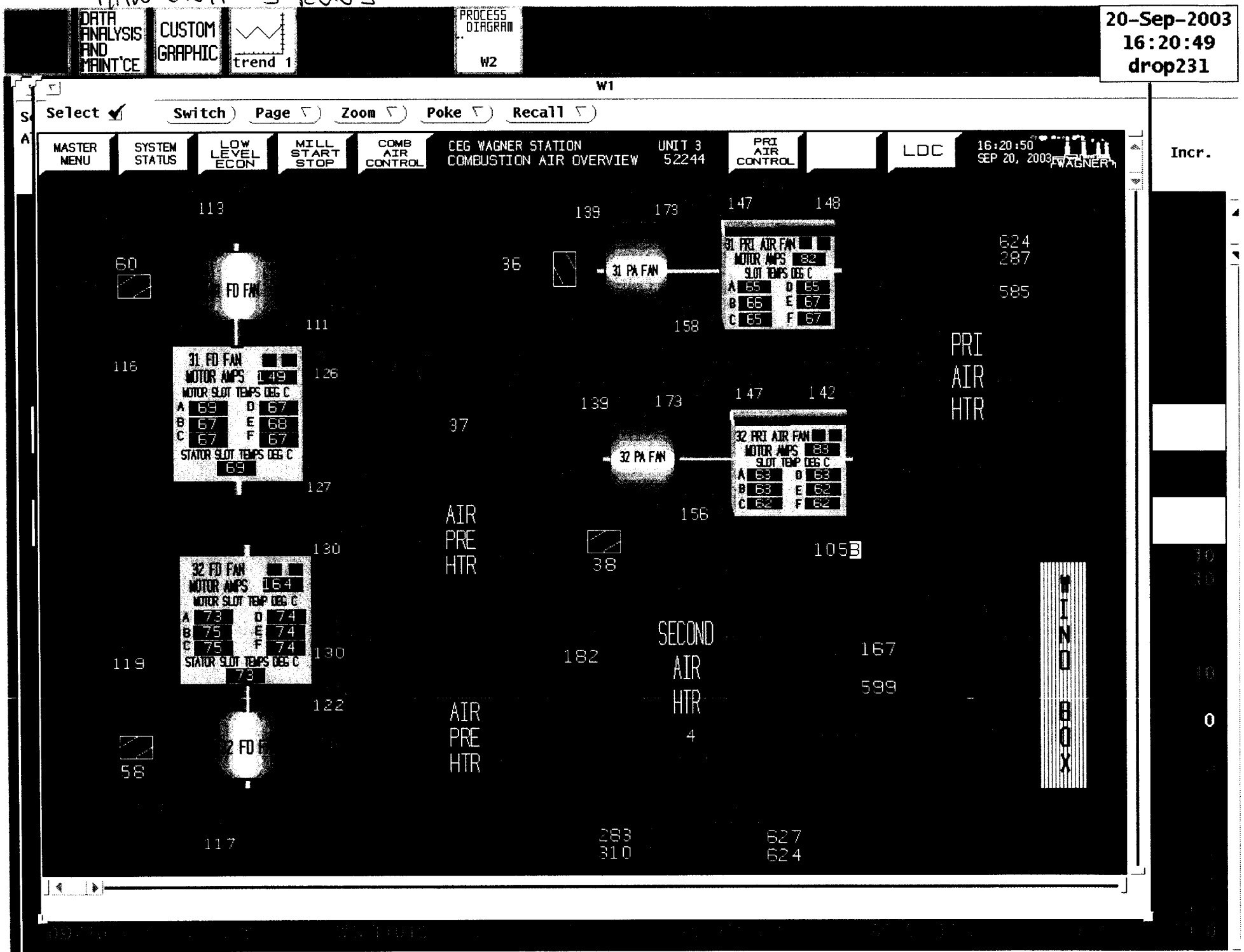
BYPASS JOG DAMPER
OPEN CLOSE
PAUSE
LOCKOUT RESET

BYPASS SO DAMPER
OPEN CLOSE
STOP
LOCKOUT RESET

SCR MODE SELECTION
IN SERV OUT OF SERV
CANCEL

SONIC HORN SEQ
ON
RUN STOP
HOLD RESUME

HAW UNIT 3 RUN 3



HAW UNIT 3 12003

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2

20-Sep-2003
16:21:08
drop231

W1

Select ✓ | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS

CEG WAGNER STATION UNIT 3
ECON OUTLET O2 OVERVIEW 52290

16:21:10
SEP 20, 2003

WAGNER

AVERAGE O2 SIGNAL 3.61 PCT

NORTH

O2 PROBE #8
4.10 PCT

O2 PROBE #4
8.23 PCT

O2 PROBE #7
3.69 PCT

O2 PROBE #3
8.12 PCT

O2 PROBE #6
3.38 PCT

7 FEET

O2 PROBE #2
7.69 PCT

O2 PROBE #5
3.40 PCT

10.8 FEET

O2 PROBE #1
5.67 PCT

40 FEET

ECONOMIZER OUTLET 115 FT EL

HAW UNIT 3 12UN 3

DATA ANALYSIS AND MAINT'CE | CUSTOM GRAPHIC | trend 1 | PROCESS DIAGRAM W2 | 20-Sep-2003 16:21:40 drop231

W1

Select | Switch | Page | Zoom | Poke | Recall

MASTER MENU | SYSTEM STATUS | MILS 20.9 | CEG WAGNER STATION LOAD DEMAND COMPUTER | UNIT 3 52390 | LAMBDA MW #3 332.0 | AGC DEMAND 311 MW | 16:21:41 SEP 20, 2003 | WAGNER

TURBINE MASTER

UNIT LOAD 261 MW

LOC DEMAND 264 MW

THROT PRESS 3454 PSIG

TP SETPNT 3450 PSIG

MEGAWATTS: MW | TARGET | UNIT | DEMAND

S 264.81

AUTO

AUTO | HAND

OUT

MEGAWATT TARGET
310 MW
ENTER | GO | HOLD

CONTROL MODE
OLM | REMT | BF2R | TF2R
SUSD | PRMP | OBFR | TFMW

RATE
1.0 MW/MIN ENTER

HI LIMIT
315 MW ENTER

LOW LIMIT
140 MW ENTER

HOURLY TOTALS

	MWHR	MVHR
HP	176	29
LP	124	22
GROSS	299	
PLANT	0.0	
UNIT	14.1	
33 BFP	0.0	
NET	-14	

METER READINGS

PULV RUNBACK
BYPASS NORMAL

MANUAL MODES

TP TARGET
3450 PSIG
ENTER | GO | HOLD

TP RATE
5 PSI/MIN ENTER

CONTINGENT FUNCTIONS
RUNDOWNS RUNBACKS

BLOCK INCREASE

BLOCK DECREASE

BOILER MASTER

THROT PRESS: TARGET | BLR DEMAND

S 3450.00

AUTO

AUTO | HAND

OUT

Plant Name: WGNR

General Average Report

Reporting Period: 09/20/2003 to 09/20/2003

Site Name: UNIT3

Time of Report: 09/21/03 06:34

Data Averaging Type: 6m

Rolling Average Interval: 1

Date	Time	MW_P60 (MW)
09/20/03	10:30	305.83
	10:36	305.01
	10:42	305.16
	10:48	305.34
	10:54	305.00
	11:00	306.17
	11:06	305.01
	11:12	305.49
	11:18	305.99
	11:24	305.01
	11:30	305.17
	11:36	305.32
	11:42	305.01
	11:48	305.33
	11:54	305.00
	12:00	305.00
	12:06	305.83
	12:12	305.00
	12:18	305.16
	12:24	305.84
	12:30	304.83
	12:36	305.17
	12:42	305.16
	12:48	305.50
	12:54	305.34
	13:00	305.66
	13:06	305.34
	13:12	305.00
	13:18	305.33
	13:24	305.33
	13:30	304.99
	13:36	306.00
	13:42	306.17
	13:48	304.50
	13:54	305.17
	14:00	305.17
	14:06	305.50
	14:12	305.01
	14:18	305.16
	14:24	305.66
	14:30	305.34
	14:36	305.33
	14:42	304.84
	14:48	304.83
	14:54	295.40
	15:00	262.76
	15:06	256.51
	15:12	257.51
	15:18	260.14
	15:24	261.84

General Average Report

Reporting Period: 09/20/2003 to 09/20/2003

Site Name: UNIT3 Time of Report: 09/21/03 06:34

Data Averaging Type: 6m Rolling Average Interval: 1

Date	Time	MW_P60 (MW)
09/20/03	15:30	259.86
	15:36	260.29
	15:42	262.30
	15:48	264.00
	15:54	263.85
	16:00	262.67
	16:06	262.67
	16:12	263.01
	16:18	262.00
	16:24	262.33
	16:30	255.44
	16:36	240.96
	16:42	227.45
	16:48	218.22
	16:54	204.27
	17:00	204.45
	17:06	208.20
	17:12	205.48
	17:18	207.69
	17:24	205.78
	17:30	206.56
	17:36	206.42
	17:42	206.42
	17:48	206.59
	17:54	206.57
	18:00	206.76
	18:06	206.23

RUN 3

Average =	276.28
Maximum =	306.17
Minimum =	204.27
Possible Values =	77
Included Values =	77
Total =	21273.62

* - excluded values (missing, OOC, invalid, suspect)
< - missing
T - out-of-control
I - invalid
S - suspect
H - exceedance
F - stack not operating
B - invalid (PADER)
U - missing data substituted
-999 - missing value
-888 - value could not be calculated

APPENDIX D

COAL AND ASH LABORATORY ANALYSES:

D.1 BRANDON SHORES CAMPAIGN ONE

D.2 CRANE STATION CAMPAIGN ONE

D.3 WAGNER STATION CAMPAIGN ONE

D.4 CAMPAIGN TWO: BRANDON SHORES AND WAGNER

APPENDIX D.1

BRANDON SHORES COAL AND ASH ANALYSES

CAMPAIGN ONE

SGS

ADDRESS ALL CORRESPONDENCE TO:
COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1865

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Sample ID:

BRANDON SHORES
Unit #1
RUN 2
4/22/03

MATOUSAK

Kind of sample reported to us: Coal

Sample taken at: BRANDON SHORES

Sample taken by: Yourselves

Date sampled: April 22, 2003

Date received: April 28, 2003

Analysis Report No. 86-10675-55

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	7.20	xxxxx
% Ash	11.23	12.10
% Volatile	xxxxx	xxxxx
% Fixed Carbon	xxxxx	xxxxx
	100.00	100.00
Btu/lb	12189 ✓	13135
% Sulfur	0.66	0.71
MAF Btu		14943

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	7.20	xxxxx
% Carbon	69.04	74.40
% Hydrogen	4.15	4.47
% Nitrogen	1.29	1.39
% Sulfur	0.66	0.71
% Ash	11.23	12.10
% Oxygen(diff)	6.43	6.93
	100.00	100.00

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1966

June 27, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us

Sample taken at BRANDON

Sample taken by Yourselves

Date sampled ------

Date received June 13, 2003

Brandon Shores
Unit #1
Run 1

EMISSION STRATEGIES

SHEILA GLESMAN

Analysis report no. 86-10735-02

PARAMETER	RESULTS ppm
Mercury, Hg	0.09 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21220
TEL: (410) 355-1958
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at BRANDON

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

ASH
B1
RUN 1
NORTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-25

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	10.65 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

ADDRESS ALL CORRESPONDENCE TO:
COMMERCIAL TESTING & ENGINEERING CO.
1601-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1950
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
B1
RUN 1
SOUTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-26

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	9.12 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 366-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
B1
RUN 2
NORTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-27

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	9.96 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
1601-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1.000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Youreelves
Date sampled	------
Date received	May 21, 2003

ASH
B1
RUN 2
SOUTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-28

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	8.16 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1950
FAX: (410) 366-1985

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
	ASH
	B1
Sample taken at	BRANDON
	RUN 3
	NORTH
Sample taken by	Yourselves
	EMISSION STRATEGIES
Date sampled	------
	SHEILA GLESMAN/STEVE MATOUSEK
Date received	May 21, 2003

Analysis report no. 86-10701-29

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	9.40 %

MEMBER ACIL

Respectfully submitted.
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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COMMERCIAL TESTING & ENGINEERING CO.
1601-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1950
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
B1
RUN 3
SOUTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-30

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	7.92 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1966

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Sample ID:

BRANDON SHORES
Unit #2
RUN 2
4/17/03

MATOUSAK

Kind of sample reported to us Coal

Sample taken at BRANDON SHORES

Sample taken by Yourselves

Date sampled April 17, 2003

Date received April 28, 2003

Analysis Report No. 86-10675-52

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	7.58	xxxxx
% Ash	12.32	13.33
% Volatile	xxxxx	xxxxx
% Fixed Carbon	xxxxx	xxxxx
	100.00	100.00
Btu/lb	11899 ✓	12875
% Sulfur	0.67	0.72
MAF Btu		14855

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	7.58	xxxxx
% Carbon	67.24	72.75
% Hydrogen	4.03	4.36
% Nitrogen	1.23	1.33
% Sulfur	0.67	0.72
% Ash	12.32	13.33
% Oxygen(diff)	6.93	7.51
	100.00	100.00

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

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BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at BRANDON

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

ASH
B2
RUN 1
NORTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-19

PARAMETER	RESULTS ppm
Mercury, Hg	0.04 ppm
Loss on Ignition	2.47 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 366-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	-------
Date received	May 21, 2003

ASH
B2
RUN 1
SOUTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-20

PARAMETER	RESULTS ppm
Mercury, Hg	0.05 ppm
Loss on Ignition	11.00 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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TEL: (410) 355-1858
FAX: (410) 355-1865

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at BRANDON

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

ASH
B2
RUN 2
NORTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-21

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	2.09 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH	ASH B2 RUN 2 SOUTH
Sample taken at	BRANDON	EMISSION STRATEGIES
Sample taken by	Yourselves	SHEILA GLESMAN/STEVE MATOUSEK
Date sampled	------	
Date received	May 21, 2003	

Analysis report no. 86-10701-22

PARAMETER	RESULTS ppm
Mercury, Hg	0.05 ppm
Loss on Ignition	9.79 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
B2
RUN 3
NORTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-23

PARAMETER	RESULTS ppm
Mercury, Hg	<0.04 ppm
Loss on Ignition	3.72 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	BRANDON
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
B2
RUN 3
SOUTH

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-24

PARAMETER	RESULTS ppm
Mercury, Hg	0.05 ppm
Loss on Ignition	12.19 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

APPENDIX D.2

CRANE STATION COAL AND ASH ANALYSES

CAMPAIGN ONE

SGS

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BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1966

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
	COAL
	C1-COAL-0417
Sample taken at	CRANE
Sample taken by	Yourselves
	EMISSION STRATEGIES
Date sampled	------
	SHEILA GLESMAN/STEVE MATOUSEK
Date received	May 21, 2003

Analysis report no. 86-10701-37

PARAMETER	RESULTS ppm
Mercury, Hg	0.26 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1985

June 27, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
	COAL
	C1-COAL-0417
Sample taken at	CRANE
Sample taken by	Yourselves
	EMISSION STRATEGIES
Date sampled	------
	SHEILA GLESMAN
Date received	June 13, 2003

Analysis report no. 86-10735-03

PARAMETER	RESULTS ppm
Mercury, Hg	0.26 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Kind of sample reported to us ASH

Sample taken at CRANE

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

Sample identification by
Yourselves

ASH
C1-COMPOSITE-0417

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-36

PARAMETER	RESULTS ppm
Mercury, Hg	0.80 ppm
Loss on Ignition	13.93 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

ADDRESS ALL CORRESPONDENCE TO:
COMMERCIAL TESTING & ENGINEERING CO.
1601-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1868
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

COAL
C1-COAL-0418

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-39

PARAMETER	**RESULTS ppm**
Mercury, Hg	0.16 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1950
FAX: (410) 355-1966

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1-COMPOSITE-0418

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-38

PARAMETER	RESULTS ppm
Mercury, Hg	0.82 ppm
Loss on Ignition	19.28 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

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COMMERCIAL TESTING & ENGINEERING CO.
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BALTIMORE, MD 21226
TEL: (410) 355-1968
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

COAL
C1-COAL-0419

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-41

PARAMETER	**RESULTS ppm**
Mercury, Hg	0.07 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1-COMPOSITE-0419

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-40

PARAMETER	RESULTS ppm
Mercury, Hg	0.71 ppm
Loss on Ignition	14.26 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

ADDRESS ALL CORRESPONDENCE TO:
COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
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TEL: (410) 355-1965
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

COAL
C1-COAL-0420

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-43

PARAMETER	RESULTS ppm
Mercury, Hg	0.08 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

ADDRESS ALL CORRESPONDENCE TO:
COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1-COMPOSITE-0420

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-42

PARAMETER	RESULTS ppm
Mercury, Hg	0.95 ppm
Loss on Ignition	14.39 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1966

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

COAL
C1-COAL-0421

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-45

PARAMETER	**RESULTS ppm**
Mercury, Hg	0.22 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Kind of sample reported to us ASH

Sample taken at CRANE

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

Sample identification by
Yourselves

ASH
C1-COMPOSITE-0421

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-44

PARAMETER	RESULTS ppm
Mercury, Hg	0.88 ppm
Loss on Ignition	14.17 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	COAL
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

COAL
C1-COAL-0422

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-47

PARAMETER	RESULTS ppm
Mercury, Hg	0.13 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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June 4, 2003

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BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1-COMPOSITE-0422

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-46

PARAMETER	RESULTS ppm
Mercury, Hg	0.68 ppm
Loss on Ignition	11.87 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

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BALTIMORE, MD 21226
TEL: (410) 355-1888
FAX: (410) 355-1965

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	Coal
Sample taken at	C.P. CRANE
Sample taken by	Yourselves
Date sampled	April 23, 2003
Date received	April 28, 2003

Sample ID:

C.P. CRANE
Unit #1
11B FEEDER
RUN 1
4/23/03

MATOUSAK

Analysis Report No. 86-10675-27

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	6.72	XXXXX
% Ash	7.81	8.37
% Volatile	XXXXX	XXXXX
% Fixed Carbon	XXXXX	XXXXX
	100.00	100.00
Btu/lb	12985	13920
% Sulfur	1.74	1.86
MAF Btu		15192

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	6.72	XXXXX
% Carbon	72.66	77.89
% Hydrogen	4.51	4.84
% Nitrogen	1.37	1.47
% Sulfur	1.74	1.86
% Ash	7.81	8.37
% Oxygen(diff)	5.19	5.57
	100.00	100.00

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

ADDRESS ALL CORRESPONDENCE TO:
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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1956
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1
RUN 1
COMPOSITE

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-31

PARAMETER	RESULTS ppm
Mercury, Hg	1.10 ppm
Loss on Ignition	13.75 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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COMMERCIAL TESTING & ENGINEERING CO.
1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL.: (410) 355-1950
FAX: (410) 355-1965

June 3, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1
RUN 2
COMPOSITE

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-32

PARAMETER	**RESULTS ppm**
Mercury, Hg	1.50 ppm
Loss on Ignition	16.62 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 3, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1
RUN 3
COMPOSITE

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-33

PARAMETER	RESULTS ppm
Mercury, Hg	1.50 ppm
Loss on Ignition	19.58 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us COAL

COAL
C1-COAL-0425

Sample taken at CRANE

Sample taken by Yourselves

EMISSION STRATEGIES

Date sampled ------

Date received May 21, 2003

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-49

PARAMETER	RESULTS ppm
Mercury, Hg	0.07 ppm

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 4, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C1-COMPOSITE-0425

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-48

PARAMETER	RESULTS ppm
Mercury, Hg	0.78 ppm
Loss on Ignition	18.54 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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BALTIMORE, MD 21226
TEL: (410) 355-1950
FAX: (410) 355-1955

June 3, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C2
RUN 1
COMPOSITE

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-34

PARAMETER	RESULTS ppm
Mercury, Hg	0.23 ppm
Loss on Ignition	3.09 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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TEL: (410) 355-1966
FAX: (410) 355-1965

June 3, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	CRANE
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
C2
RUN 2
COMPOSITE

EMISSION STRATEGIES

SHEILA GLASSMAN/STEVE MATOUSEK

Analysis report no. 86-10701-35

PARAMETER	RESULTS ppm
Mercury, Hg	0.22 ppm
Loss on Ignition	3.60 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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TEL: (410) 355-1950
FAX: (410) 355-1856

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us: Coal

Sample taken at: C.P. CRANE

Sample taken by: Yourselves

Date sampled: April 25, 2003

Date received: April 28, 2003

Sample ID:

C.P. CRANE
Unit #2
21B FEEDER
RUN 2
4/25/03

MATOUSAK

Analysis Report No. 86-10675-38

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	2.70	xxxxx
% Ash	8.03	8.25
% Volatile	xxxxx	xxxxx
% Fixed Carbon	xxxxx	xxxxx
	100.00	100.00
Btu/lb	13423	13795
% Sulfur	2.49	2.56
MAF Btu		15035

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	2.70	xxxxx
% Carbon	74.97	77.05
% Hydrogen	4.62	4.75
% Nitrogen	1.46	1.50
% Sulfur	2.49	2.56
% Ash	8.03	8.25
% Oxygen(diff)	5.73	5.89
	100.00	100.00

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111183
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 260	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/1/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	1.74	%
Moisture	0.00	%

SPECIAL NOTES (if any):

AVG = 2.7%
(all 10 samples)

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111184
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 250	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/1/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	2.88	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111185
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 290	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/1/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	2.41	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111186
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 210	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/1/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	3.24	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111187
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 230	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/1/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	1.74	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111188
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 200	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/6/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	3.26	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111189
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 270	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/6/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	3.21	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111190
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 270	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/6/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	2.57	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111191
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 240	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/6/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	2.75	%
Moisture	0.00	%

SPECIAL NOTES (if any):

SAMPLE REPORT

REPORT DATE: 5/6/03

ORG. / DEPT:	C. P. Crane	SAMPLE NUMBER:	F111192
SAMPLE SITE:	C.P. Crane Unit 2	REFERENCE ID:	
LOCATION:	Comp 280	SAMPLE COLL. DATE:	4/25/2003
SAMPLE DESCRIPTION:		DATE LOGGED:	4/30/2003
SUBMITTED BY:	Davidson, F.	DATE COMPLETED:	5/6/2003
CUSTOMER ADDRESS:	C. P. Crane	SAMPLE COLLECTION TIME:	
		SAMPLED BY:	

COMMENTS:

ANALYSIS OR TEST NAME	RESULT	UNITS
LECO MAC 400		
Loss on ignition	3.14	%
Moisture	0.00	%

SPECIAL NOTES (if any):

APPROVED BY:_____WK_____

APPENDIX D.3

WAGNER STATION COAL AND ASH ANALYSES

CAMPAIGN ONE

SGS

ADDRESS ALL CORRESPONDENCE TO:
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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1985

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Sample ID:

H.A. WAGNER
Unit #2
RUN 3
4/15/03

MATOUSAK

Kind of sample reported to us: Coal

Sample taken at: H.A. WAGNER

Sample taken by: Yourselves

Date sampled: April 15, 2003

Date received: April 28, 2003

Analysis Report No. 86-10675-46

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.75	xxxxx
% Ash	10.55	11.19
% Volatile	xxxxx	xxxxx
% Fixed Carbon	xxxxx	xxxxx
	100.00	100.00
Btu/lb	12670	13443
% Sulfur	0.75	0.80
MAF Btu		15137

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.75	xxxxx
% Carbon	70.34	74.63
% Hydrogen	4.18	4.43
% Nitrogen	1.33	1.41
% Sulfur	0.75	0.80
% Ash	10.55	11.19
% Oxygen(diff)	7.10	7.54
	100.00	100.00

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

ADDRESS ALL CORRESPONDENCE TO:
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TEL: (410) 355-1968
FAX: (410) 355-1965

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH	ASH
		W2
Sample taken at	WAGNER	RUN 1
Sample taken by	Yourselves	EMISSION STRATEGIES
Date sampled	------	SHEILA GLESMAN/STEVE MATOUSEK
Date received	May 21, 2003	

Analysis report no. 86-10701-11

PARAMETER	RESULTS ppm
Mercury, Hg	0.19 ppm
Loss on Ignition	27.74 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

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TEL: (410) 355-1958
FAX: (410) 355-1986

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample	ASH
reported to us	ASH
	W2
Sample taken at	WAGNER RUN 2
Sample taken by	Yourselves
	EMISSION STRATEGIES
Date sampled	------
	SHEILA GLESMAN/STEVE MATOUSEK
Date received	May 21, 2003

Analysis report no. 86-10701-12

PARAMETER	RESULTS ppm
Mercury, Hg	0.14 ppm
Loss on Ignition	40.78 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

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1501-A EAST PATAPSCO AVENUE
BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1886

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	WAGNER
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
W2
RUN 3

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-13

PARAMETER	RESULTS ppm
Mercury, Hg	0.11 ppm
Loss on Ignition	20.52 %

MEMBER ACIL

Respectfully submitted,
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

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FAX: (410) 355-1965

June 11, 2003

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us: Coal

Sample taken at: H.A. WAGNER

Sample taken by: Yourselves

Date sampled: April 16, 2003

Date received: April 28, 2003

Sample ID:

H.A. WAGNER
Unit #3
RUN 3
4/16/03

MATOUSAK

Analysis Report No. 86-10675-45

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.00	XXXXX
% Ash	10.38	11.28
% Volatile	XXXXX	XXXXX
% Fixed Carbon	XXXXX	XXXXX
	100.00	100.00
Btu/lb	12202	13263
% Sulfur	0.75	0.82
MAF Btu		14949

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.00	XXXXX
% Carbon	68.83	74.81
% Hydrogen	4.09	4.45
% Nitrogen	1.39	1.51
% Sulfur	0.75	0.82
% Ash	10.38	11.28
% Oxygen(diff)	6.56	7.13
	100.00	100.00

MEMBER ACIL

Respectfully submitted.
COMMERCIAL TESTING & ENGINEERING CO.

Baltimore Laboratory

SGS

June 2, 2003

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TEL: (410) 355-1958
FAX: (410) 355-1965

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	WAGNER
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
W3
RUN 1
ROW 1

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-14

PARAMETER	RESULTS ppm
Mercury, Hg	0.28 ppm
Loss on Ignition	14.62 %

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June 2, 2003

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Baltimore, MD 21226

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BALTIMORE, MD 21226
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FAX: (410) 966-1965

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at WAGNER

Sample taken by Yourselves

Date sampled ------

Date received May 21, 2003

ASH
W3
RUN 2
ROW 1

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-15

PARAMETER	RESULTS ppm
Mercury, Hg	0.37 ppm
Loss on Ignition	14.77 %

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FAX: (410) 355-1965

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	WAGNER
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
W3
RUN 2
ROW 2

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-16

PARAMETER	RESULTS ppm
Mercury, Hg	0.50 ppm
Loss on Ignition	17.70 %

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FAX: (410) 355-1965

Constellation Energy Group
Fort Smallwood Complex
1000 Brandon Shores Road
Baltimore, MD 21226

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	WAGNER
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
WJ
RUN 3
ROW 1

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-17

PARAMETER	RESULTS ppm
Mercury, Hg	0.35 ppm
Loss on Ignition	13.36 %

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June 2, 2003

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BALTIMORE, MD 21226
TEL: (410) 355-1958
FAX: (410) 355-1965

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	WAGNER
Sample taken by	Yourselves
Date sampled	------
Date received	May 21, 2003

ASH
W3
RUN 3
ROW 2

EMISSION STRATEGIES

SHEILA GLESMAN/STEVE MATOUSEK

Analysis report no. 86-10701-18

PARAMETER	RESULTS ppm
Mercury, Hg	0.62 ppm
Loss on Ignition	22.07 %

MEMBER ACIL

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APPENDIX D.4

BRANDON SHORES AND WAGNER STATION COAL AND ASH ANALYSES

CAMPAIGN TWO

TABLE 13:Coal

Lab Data Set ID	Run #	Sample ID	Unit and Run ID, Camp=Campaign	ng/g	"Blk Cor" ng Hg /g	Replicate Analyses Average
THG9-031029-1	15614	C1-001	HAW 3, Run 3, Camp One	64.163 ng/g	64.09	
THG9-031029-1	15615	C1-002	HAW 3, Run 2, Camp One	66.119 ng/g	66.04	
THG9-031029-1	15616	C1-003	HAW 2, Run 3, Camp One	121.451 ng/g	121.38	
THG9-031029-1	15625	C1-004	HAW 2, Run 2, Camp One	61.239 ng/g	61.16	
THG9-031029-1	15626	C1-005	Crane 1, Run 1, Camp One	199.052 ng/g	198.98	
THG9-031029-1	15627	C1-006	Crane 2, Run 2, Camp One	66.834 ng/g	66.76	
THG9-031029-1	15628	C1-007	Crane 2, Run 3, Camp One	72.210 ng/g	72.14	
THG9-031029-1	15629	C1-008	Brandon 1, Run 2, Camp One	68.379 ng/g	68.30	
THG9-031029-1	15630	C1-009	Brandon 1, Run 3, Camp One	57.131 ng/g	57.06	
THG9-031029-1	15633	C1-010	Brandon 2, Run 2, Camp One	93.335 ng/g	93.26	
THG9-031029-1	15634	C1-011	Brandon 2, Run 1, Camp One	116.674 ng/g	116.60	
THG9-031029-1	15635	9/17/03 COAL	Brandon 1, Camp Two	41.998 ng/g	41.92	
THG9-031029-1	15636	9/19/03 COAL	HAW 3, Low Load, Camp Two	82.567 ng/g	82.49	
THG9-031029-1	15637	9/20/03 COAL	HAW 3, High Load, Camp Two	62.548 ng/g	62.47	
THG9-031029-1	15638	9/21/03 COAL	Brandon 2, Camp Two	56.122 ng/g	56.05	74.62 ng
THG9-031029-1	15639	10/2/03 COAL	Brandon 1, Camp Two	68.384 ng/g	68.31	
THG9-031029-1	15640	10/3/03 COAL	Brandon 1, Camp Two	60.454 ng/g	60.38	

TABLE 15:Fly Ash

Lab Data Set ID	Run #	Sample ID	ng/g	"Blk Cor" ng HgI(0) /trap
THG9-031016-1	15047	9/17/03-RUN1-ASH	151.869 ng/g	151.45
THG9-031016-1	15053	9/17/03-RUN3-ASH	115.982 ng/g	115.56
THG9-031016-1	15055	9/19/03-LOW LOAD-ASH	151.098 ng/g	150.68
THG9-031016-1	15057	9/20/03-HIGH LOAD-ASH	50.101 ng/g	49.68
THG9-031016-1	15059	9/21/03-RUN1-ASH	29.573 ng/g	29.16
THG9-031016-1	15069	9/21/03-RUN2-ASH	11.119 ng/g	10.70

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FAX: (410) 355-1965

October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample taken at

Sample taken by Yourselves

Date sampled September 17, 2003

Date received October 14, 2003

Sample ID:

9/17/03
COAL

BS 1

Analysis Report No. 86-10844-01

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.09	xxxxx
% Ash	9.47	10.30
% Volatile	31.64	34.42
% Fixed Carbon	50.80	55.28
	100.00	100.00
Btu/lb	12255	13334
% Sulfur	0.67	0.73
MAF Btu		14865

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.09	xxxxx
% Carbon	69.64	75.77
% Hydrogen	4.47	4.86
% Nitrogen	1.42	1.54
% Sulfur	0.67	0.73
% Ash	9.47	10.30
% Oxygen(diff)	6.24	6.80
	100.00	100.00
% Chlorine	0.13	0.14

MEMBER ACIL

Respectfully submitted,
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October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	
Sample taken by	Yourselves
Date sampled	September 17, 2003
Date received	October 14, 2003

Sample ID:

9/17/03 BRANDON SHORES 1
RUN #1
ASH

Analysis Report No. 86-10844-07

Loss On Ignition 16.28%

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October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at

Sample taken by Yourselves

Date sampled September 17, 2003

Date received October 14, 2003

Sample ID:

9/17/03
RUN #3 ~~WAGNER 3~~ BRANDON SHORES 1
ASH

Analysis Report No. 86-10844-08

Loss On Ignition 16.06%

MEMBER ACIL

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FAX: (410) 355-1965

October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample ID:

Sample taken at

10/02/03 BS 1
COAL

Sample taken by Yourselves

Date sampled October 2, 2003

Date received October 14, 2003

Analysis Report No. 86-10844-05

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.35	xxxxx
% Ash	11.03	12.04
% Volatile	30.96	33.78
% Fixed Carbon	49.66	54.18
	100.00	100.00
Btu/lb	11975	13066
% Sulfur	0.63	0.69
MAF Btu		14854

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	8.35	xxxxx
% Carbon	67.84	74.02
% Hydrogen	4.35	4.75
% Nitrogen	1.33	1.45
% Sulfur	0.63	0.69
% Ash	11.03	12.04
% Oxygen(diff)	6.47	7.05
	100.00	100.00
% Chlorine	0.12	0.13

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TEL: (410) 355-1958
FAX: (410) 355-1965

October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample taken at

Sample taken by Yourselves

Date sampled October 3, 2003

Date received October 14, 2003

Sample ID:

10/03/03 BS 1
COAL

Analysis Report No. 86-10844-06

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.16	xxxxx
% Ash	10.45	11.02
% Volatile	32.16	33.91
% Fixed Carbon	52.23	55.07
	100.00	100.00
Btu/lb	12733	13426
% Sulfur	0.70	0.74
MAF Btu		15089

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.16	xxxxx
% Carbon	71.65	75.55
% Hydrogen	4.55	4.80
% Nitrogen	1.50	1.58
% Sulfur	0.70	0.74
% Ash	10.45	11.02
% Oxygen(diff)	5.99	6.31
	100.00	100.00
% Chlorine	0.13	0.14

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FAX: (410) 355-1965

October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample taken at

Sample taken by Yourselves

Date sampled September 21, 2003

Date received October 14, 2003

Sample ID:

9/21/03
COAL BS 2

Analysis Report No. 86-10844-04

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.64	xxxxx
% Ash	9.64	10.22
% Volatile	33.08	35.06
% Fixed Carbon	51.64	54.72
	100.00	100.00
Btu/lb	12751	13513
% Sulfur	0.66	0.70
MAF Btu		15051

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	5.64	xxxxx
% Carbon	71.52	75.80
% Hydrogen	4.62	4.90
% Nitrogen	1.45	1.54
% Sulfur	0.66	0.70
% Ash	9.64	10.22
% Oxygen(diff)	6.47	6.84
	100.00	100.00
% Chlorine	0.11	0.12

MEMBER ACIL

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October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us	ASH
Sample taken at	
Sample taken by	Yourselves
Date sampled	September 21, 2003
Date received	October 14, 2003

Sample ID:

9/21/03
RUN #1 BRANDON SHORES 2
ASH

Analysis Report No. 86-10844-11

Loss On Ignition 12.16%

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Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample taken at

Sample taken by Yourselves

Date sampled September 19, 2003

Date received October 14, 2003

Sample ID:

9/19/03 BS HAW 3
COAL LOW LOAD

Analysis Report No. 86-10844-02

PROXIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	6.04	xxxxx
% Ash	9.94	10.58
% Volatile	32.38	34.46
% Fixed Carbon	51.64	54.96
	100.00	100.00
Btu/lb	12700	13516
% Sulfur	0.82	0.87
MAF Btu		15115

ULTIMATE ANALYSIS

	As Received	Dry Basis
% Moisture	6.04	xxxxx
% Carbon	71.21	75.79
% Hydrogen	4.58	4.87
% Nitrogen	1.39	1.48
% Sulfur	0.82	0.87
% Ash	9.94	10.58
% Oxygen(diff)	6.02	6.41
	100.00	100.00
% Chlorine	0.13	0.14

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October 21, 2003

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447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample ID:

Sample taken at

9/19/03
LOW LOAD WAGNER 3

Sample taken by Yourselves

ASH

Date sampled September 19, 2003

Date received October 14, 2003

Analysis Report No. 86-10844-09

Loss On Ignition 12.70%

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October 21, 2003

EMISSION STRATEGIES, INC.
447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us Coal

Sample taken at

Sample taken by Yourselves

Date sampled September 20, 2003

Date received October 14, 2003

Sample ID:

9/20/03 HAW 3
COAL HIGH LOAD

Analysis Report No. 86-10844-03

PROXIMATE ANALYSIS	As Received	Dry Basis
% Moisture	9.16	xxxxx
% Ash	9.73	10.71
% Volatile	31.12	34.26
% Fixed Carbon	49.99	55.03
	100.00	100.00
Btu/lb	12147	13372
% Sulfur	0.82	0.90
MAF Btu		14976

ULTIMATE ANALYSIS	As Received	Dry Basis
% Moisture	9.16	xxxxx
% Carbon	68.81	75.75
% Hydrogen	4.42	4.87
% Nitrogen	1.34	1.48
% Sulfur	0.82	0.90
% Ash	9.73	10.71
% Oxygen(diff)	5.72	6.29
	100.00	100.00
% Chlorine	0.12	0.13

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October 21, 2003

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447 Larkspur Lane
Severna Park, MD 21146

Sample identification by
Yourselves

Kind of sample reported to us ASH

Sample taken at

Sample taken by Yourselves

Date sampled September 20, 2003

Date received October 14, 2003

Sample ID:

9/20/03
HIGH LOAD WAGNER3
ASH

Analysis Report No. 86-10844-10

Loss On Ignition 7.68%

MEMBER ACIL

Respectfully submitted,
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APPENDIX E
FLUE GAS MERCURY MEASUREMENTS

E.1 COMPARISONS OF FLUE GAS ANALYSIS RESULTS BETWEEN TEST METHODS FROM CAMPAIGN ONE

E.2 FGS SORBENT TRAP REPORTED LAB DATA FROM CAMPAIGN ONE

E.3 LABORATORY FLUE GAS MEASUREMENT RESULTS FROM CAMPAIGN TWO

APPENDIX E.1
COMPARISONS OF FLUE GAS ANALYSIS RESULTS BETWEEN TEST METHODS FROM CAMPAIGN ONE

Table E-1. Brandon Shores Unit 1 comparison of FMSS and Ontario Hydro stack test results. All results are at actual O_2 in ug/dncm.

	TEST SERIES 1			TEST SERIES 2				TEST SERIES 3				
	OH Run 1	FGS Run 1B	FGS Run 1C	OH Run 2	FGS Run 2B	FGS Run 2C	FGS Run 2D	OH Run 3	FGS Run 3B	FGS Run 3C	OH Avg	FGS Avg
Particle	0.01	0.01	0.07	0.01	0.00	0.03	0.05	0.01	0.04	0.00	0.01	0.03
Vapor-Phase	8.3	6.7	6.4	7.9	5.1	7.0	10.3	6.9	4.5	1.4	7.7	5.9
Elemental Vapor	2.6	0.3	0.4	2.6	0.3	0.2	na	2.3	0.2	0.2	2.5	0.3
Oxidized Vapor	5.7	6.4	6.0	5.3	4.8	6.8	na	4.6	4.3	1.2	5.2	4.9
Total	8.3	6.7	6.5	7.9	5.1	7.0	10.3	6.9	4.5	1.4	7.7	5.9

Notes to Table E-1:

- Runs 1B and 1C note that meter power was out for some period during sampling
- Run 2C notes that meter volume was corrected
- Run 2B notes that there was no inlet filter; potentially contaminating oxidized mercury measurement
- Runs 3B and 3C note that laboratory signal low

Table E-2. Brandon Shores Unit 2 comparison of FMSS and Ontario Hydro stack test results. All results are at actual O_2 in ug/dncm.

	TEST SERIES 1				TEST SERIES 2					TEST SERIES 3					
	OH Run 1	FGS Run 1B	FGS Run 1C	FGS Run 1D	OH Run 2	FGS Run 2B		FGS Run 2C	FGS Run 2D	OH Run 3	FGS Run 3B	FGS Run 3C	FGS Run 3D	OH Avg	FGS Avg
Particle	0.02	0.01	0.01	0.01	0.01	0.12		0.03	0.01	0.01	0.00	0.03	0.04	0.01	0.03
Vapor-Phase	7.4	7.4	8.5	7.5	8.1	7.2		7.7	7.5	7.5	6.8	12.5	8.8	7.7	8.4
Elemental Vapor	2.6	0.1	0.3	na	2.8	0.4		0.3	na	2.8	0.5	0.3	na	2.7	0.3
Oxidized Vapor	4.7	7.3	8.1	na	5.3	6.8		7.4	na	4.8	6.3	12.2	na	4.9	8.0
Total	7.4	7.4	8.5	7.5	8.1	7.4		7.7	7.5	7.5	6.8	12.5	8.8	7.7	8.2

Notes to Table E-2:

- Runs 1B and 1C note that meter volumes were corrected
- Run 3B notes that sample volume is low

Table E-3. Brandon Shores Units 1 and 2 FMSS ESP inlet samples.

	UNIT 1				UNIT 2			
	1A	2A	3A	Average	1A	2A	3A	Average
Particle	0.00	0.02	0.00	0.01	0.04	0.02	0.04	0.03
Vapor-Phase	9.8	14.7	9.2	11.2	7.0	7.5	8.4	7.6
Elemental Vapor	0.4	0.2	2.1	0.9	0.7	0.6	0.3	0.5
Oxidized Vapor	9.3	14.5	7.2	10.3	6.3	6.8	8.1	7.1
Total	9.8	14.7	9.2	11.2	7.0	7.5	8.5	7.7

Notes to Table E-3:

- Run Unit 1, 2A notes that sample volume is low and the trap was sampled backwards
- Runs Unit 2, 1A and 2A note that moisture was present in sample line
- Run Unit 2, 3A notes that meter volume was corrected

Figure E-1. Brandon Shores Unit 2 Total Mercury Comparison of all Tests Conducted.

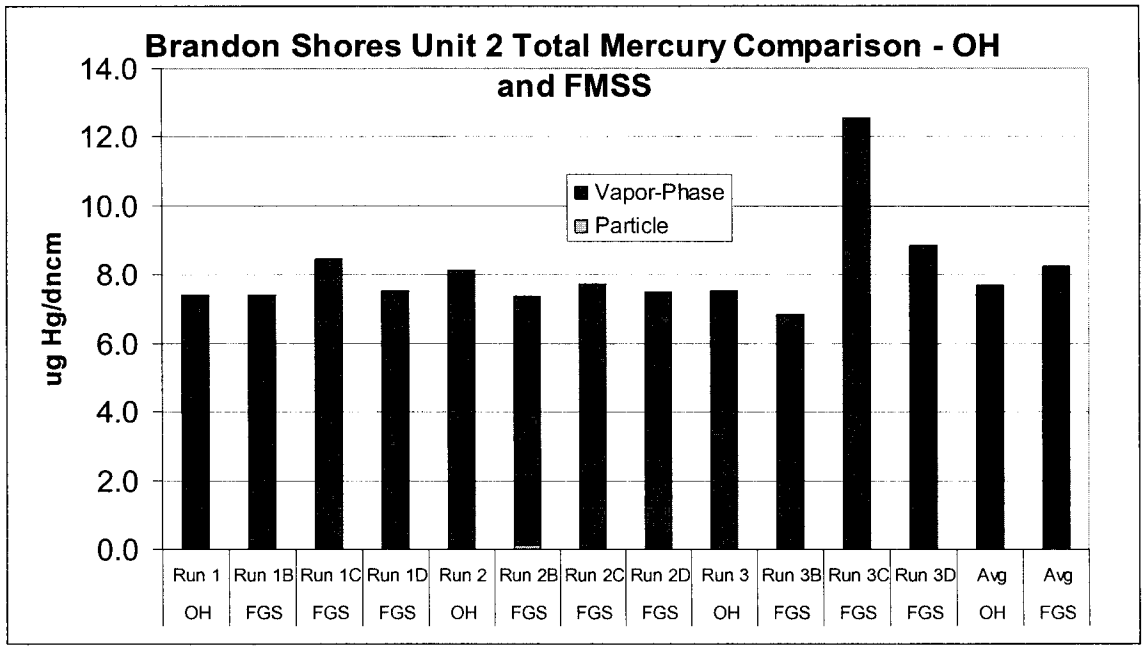


Figure E-2. Brandon Shores Unit 2 Comparison of all Speciation Tests Conducted.

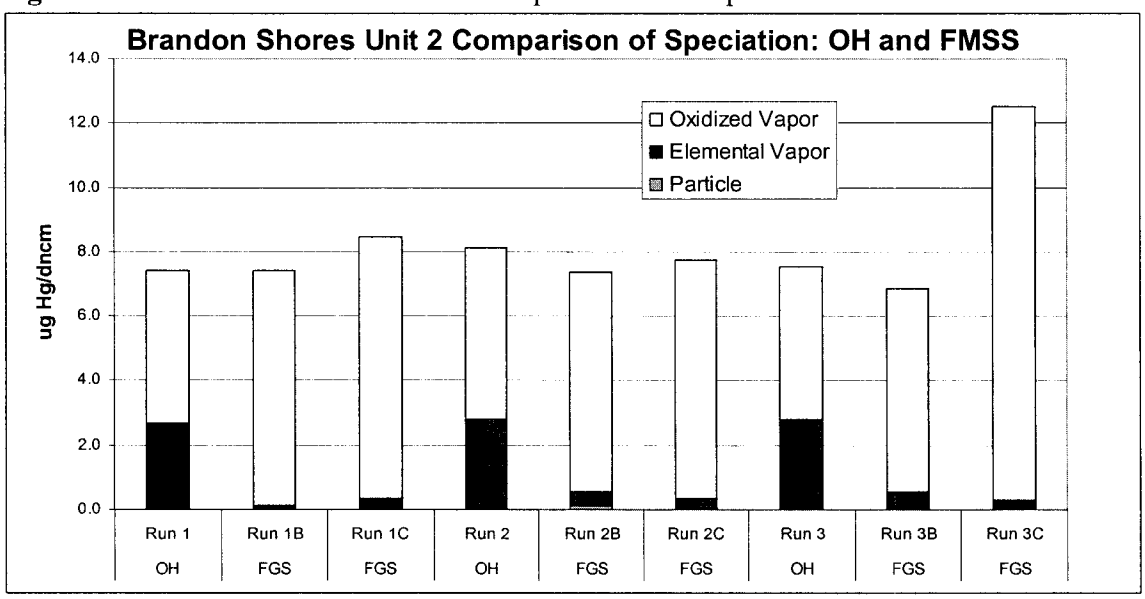


Table E-4. HA Wagner Unit 2 comparison of FMSS (Stack) and Ontario Hydro (Stack) test results. All results are at actual O_2 in ug/dncm.

		TEST SERIES 1			TEST SERIES 2					
	OH Run 1	FGS Run 1C	FGS Run 1D	FGS Run 1E	OH Run 2	FGS Run 2C	FGS Run 2D	OH Run 3	OH Average	FGS Average
Particle	0.02	0.04	0.02	0.016	0.06	na	0.01	0.04	0.04	0.02
Vapor-Phase	7.2	4.1	3.4	2.3	7.3	4.2	4.0	6.1	6.9	3.6
Elemental Vapor	1.8	0.5	0.5	na	2.3	0.5	0.7	3.0	2.4	0.5
Oxidized Vapor	5.4	3.6	2.9	na	5.1	3.7	3.3	3.1	4.5	3.4
Total	7.2	4.2	3.5	2.3	7.4	4.3	4.1	6.1	6.9	3.7

Table E-5. HA Wagner Unit 2 inlet to ESP. All results are total mercury at actual O_2 in ug/dncm.

	HA Wagner Unit 2	
	1B	2A
Particle	0.04	0.18
Elemental	0.3	2.0
Oxidized	3.2	3.0
Total	4.5	5.1

Table E-6. HA Wagner Unit 3 comparison of FMSS (ESP Outlet) and Ontario Hydro (Stack) test results. All results are at actual O_2 in ug/dncm.

	TEST SERIES 1			TEST SERIES 2			TEST SERIES 3					
	OH Run 1	FGS Run 1C	FGS Run 1D	OH Run 2	FGS Run 2C	FGS Run 2D	OH Run 3	FGS Run 3C	FGS Run 3D	FGS Run 3E	OH Average	FGS Average
Particle	0.02	0.02	0.21	0.01	0.11	0.32	0.01	0.15	3.95	0.10	0.01	0.61
Vapor-Phase	3.2	3.0	3.2	5.6	2.3	5.3	5.3	5.1	7.8	5.1	4.7	4.8
Elemental Vapor	0.5	0.2	na	0.9	na	0.1	0.7	0.3	0.1	na	0.7	0.2
Oxidized Vapor	2.8	2.8	na	4.8	na	5.2	4.6	4.8	7.7	na	4.0	4.8
Total	3.2	3.1	3.4	5.6	2.4	5.7	5.3	5.4	11.8	5.3	4.7	5.5

Notes to Table E-6:

- Run 2C indicates a problem with temperature controller: use only total mercury.
- Run 3D notes moisture in sample.

Table E-7. HA Wagner Unit 3 inlet to ESP. All results are total mercury at actual O_2 in ug/dncm.

	HA Wagner Unit 3						
	1A	1B	2A	2B	3A	3B	Average
Total	3.4	5.4	4.2	2.2	10.5	8.3	5.7

Notes to Table E-7:

- Particulate in the Hg(+2) trap resulted in obtaining only total mercury.

APPENDIX E.2
FGS SORBENT TRAP LABORATORY DATA FROM CAMPAIGN ONE

Wagner Unit #3

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	3.409	0.089	na	na	na	Particulate in Hg(II) trap - use tota
1B	Inlet	Speciation	5.402	0.309	3.578	3.887	0.272	
1C	Outlet	Speciation	3.076	0.162	2.826	2.988	0.021	
1D	Outlet	Total	3.437	na	na	3.201	0.214	
		run 1 avg	3.257	0.162	2.826	2.988	0.117	
2A	Inlet	Speciation	4.171	0.143	1.26	1.407	na	Particulate in Hg(II) trap
2B	Inlet	Speciation	2.210	0.110	1.79	1.902	na	Particulate in Hg(II) trap
2C	Outlet	Speciation	2.427	na	na	2.314	0.113	Temp Out Of Range - Speciation N
2D	Outlet	Speciation	5.663	0.102	5.18	5.281	0.320	
		run 2 avg	5.663	0.102	5.179	5.281	0.320	
3A	Inlet	Speciation	10.480	0.170	7.795	7.964	0.720	
3B	Inlet	Speciation	8.346	0.096	6.234	6.330	0.683	
3C	Outlet	Speciation	5.359	0.289	4.834	5.123	0.151	
3D	Outlet	Speciation	11.804	0.112	7.691	7.803	3.950	Likely particulate got into Hg(II) tra
3E	Outlet	Total	5.257	na	na	5.14	0.098	
		run 3 avg	7.474	0.200	6.263	6.021	1.400	
		W3 AVG - 3 run	5.465	0.155	4.756	4.764	0.612	

Wagner Unit #2

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	na	na	na	na	na	DQ - Plugged Inlet filter due to ma
1B	Inlet	Speciation	4.532	0.300	3.157	3.457	0.043	
1C	Outlet	Speciation	4.159	0.481	3.598	4.080	na	< No notes indicating a sampling p
1D	Outlet	Speciation	3.476	0.493	2.908	3.401	0.015	DQ - FMSS trap temp 68.1C - allow
1E	Outlet	Total						
2A	Inlet	Speciation	5.115	1.960	2.977	4.938	na	Speciation is Invalid - Frontier dige
2C	Outlet	Speciation	4.338	0.484	3.712	4.196	na	
2D	Outlet	Speciation	4.141	0.703	3.261	3.965	0.009	
2E	Outlet	Total	3.762	na	na	na	0.052	

Branden Unit #2

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	7.03	0.701	6.285	6.986	0.043	Vertical Probe Orientation - both IC
1B	Outlet	Speciation	[illegible]					
1C	Outlet	Speciation	[illegible]					
1D	Outlet	Total	7.54	na	na	7.535	0.007	
		run 1 avg	7.81	0.22	7.72	7.80	0.01	
2A	Inlet	Speciation	7.48	0.627	6.836	7.463	0.016	Vertical probe configuration - wate
2B	Outlet	Speciation	7.34	0.415	6.811	7.227	0.118	
2C	Outlet	Speciation	7.73	0.307	7.392	7.699	0.031	
2D	Outlet	Total	7.49	na	na	7.483	0.007	
		run 2 avg	7.52	0.36	7.10	7.47	0.05	
3A	Inlet	Speciation	[illegible]					
3B	Outlet	Speciation	6.83	0.528	6.306	6.834	na	
3C	Outlet	Speciation	12.53	0.289	12.216	12.505	0.028	
3D	Outlet	Total	8.85	na	na	8.808	0.037	
		run 3 avg	9.41	0.41	9.26	9.38	0.03	
		BS 2 AVG- 3 runs:	8.25	0.33	8.03	8.22	0.03	

Branden Unit #1

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	9.76	0.426	9.331	9.757	na	
1B	Outlet	Speciation	[illegible]					
1C	Outlet	Speciation	[illegible]					
		Run 1 avg	6.59	0.36	6.20	6.56	0.04	
2A	Inlet	Speciation	14.73	0.188	14.527	14.715	0.019	< DQ - insufficient sample volume - P
2B	Outlet	Speciation	5.11	0.323	4.787	5.110	0.000	< DQ - p noted "no pre-filter present"
2C	Outlet	Speciation	7.01	0.167	6.814	6.981	0.029	Op noted totalizer zeroed @ 13:16 (6 r
2D	Outlet	Total	10.33	na	na	10.283	0.047	
		run 2 avg	7.48	0.24	5.80	7.46	0.03	
3A	Inlet	Speciation	9.23	2.088	7.146	9.234	0.000	
3B	Outlet	Speciation	4.50	0.187	4.274	4.461	0.040	< DQ No notes from operator - hov
3C	Outlet	Speciation	1.44	0.213	1.228	1.441	0.003	< DQ - digestion note - "no plug on PI
		run 3 avg	2.97	0.20	2.75	2.95	0.02	
		BS 1 avg- 3 runs	5.68	0.27	4.92	5.66	0.03	

Crane Unit #1

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	11.320	0.573	9.872	10.444	0.876	< speciation off due to too much p
1C	Outlet	Speciation	2.410	0.014	2.393	2.407	0.004	Speciation is not accurate - no PHg
1D	Outlet	Speciation	2.195	0.014	2.179	2.193	0.001	Op noted - baghouse back on-line
2B	Inlet	Total	4.895	na	0.000	0.000	1.151	Total Hg
2C	Outlet	Speciation	1.647	0.024	1.623	1.647	0.000	No notes form site operator - not e
2D	Outlet	Total	0.296	na	0.000	0.000	0.022	DQ - number is simply not beleivab
3A	Inlet	Speciation	0.376	0.094	0.039	0.133	0.243	< Note - this entire series is not be
3B	Inlet	Total	0.475	na	0.000	0.000	0.142	< Note - this entire series is not be
3C	Outlet	Speciation	0.632	0.000	0.629	0.629	0.003	Op noted flow rate unstable - 0.1-0
3D	Outlet	Total	0.626	na	0.000	0.000	0.002	< Note - this entire series is not be

Crane Unit #2

Run #	Sample Location	Sample Type	Total Hg	Elemental	Oxidized	Vapor	Partic	
1A	Inlet	Speciation	13.02	2.75	9.92	12.67	0.344	No notes from operator
1B	Outlet	Speciation	8.66	0.14	8.49	8.64	0.030	No notes from operator
2A	Inlet	Speciation	6.38	1.63	4.70	6.32	0.058	Frontier noted from field sheet - flo
2B	Inlet	Speciation	4.19	1.24	2.76	4.00	0.187	Frontier noted from field sheet - fl
2D	Outlet	Speciation	6.74	0.05	6.67	6.72	0.020	< Frontier notes no end plugs on P
3A	Inlet	Speciation	5.29	1.71	3.47	5.18	0.114	< Sample volume too low for speci
3B	Inlet	Total	5.34	na	na	na	0.367	< Frontier noted from field sheet -
3C	Inlet	Speciation	na	na	na	na	na	Blank
3D	Outlet	Total	4.25	na	0.00	0.00	na	< Op noted total Hg trap on end of

APPENDIX E.3 LABORATORY FLUE GAS MEASUREMENT RESULTS FROM CAMPAIGN TWO

Tables E-8. Ontario Hydro flue gas results from Campaign Two. All results in ug/dncm at actual O_2.

	all results in ug/dscm						
Brandon Shores 1	PM Hg	Hg +2	Hg 0	Total	% Oxidized	% Elemental	% Particle
Run 1	0.03	6.0	0.3	6.3	95%	5%	0.5%
Run 2	0.02	6.1	0.3	6.3	96%	4%	0.3%
Run 3	0.01	6.8	1.5	8.3	82%	18%	0.1%
Average	0.02	6.3	0.7	7.0	91%	9%	0.3%

	all results in ug/dscm						
Brandon Shores 2	PM Hg	Hg +2	Hg 0	Total	% Oxidized	% Elemental	% Particle
Run 1	0.02	8.43	0.38	8.8	95%	4%	0.2%
Run 2	0.01	7.2	0.24	7.5	97%	3%	0.1%
Run 3	0.02	5.9	0.22	6.1	96%	4%	0.3%
Average	0.02	7.2	0.3	7.5	96%	4%	0.2%

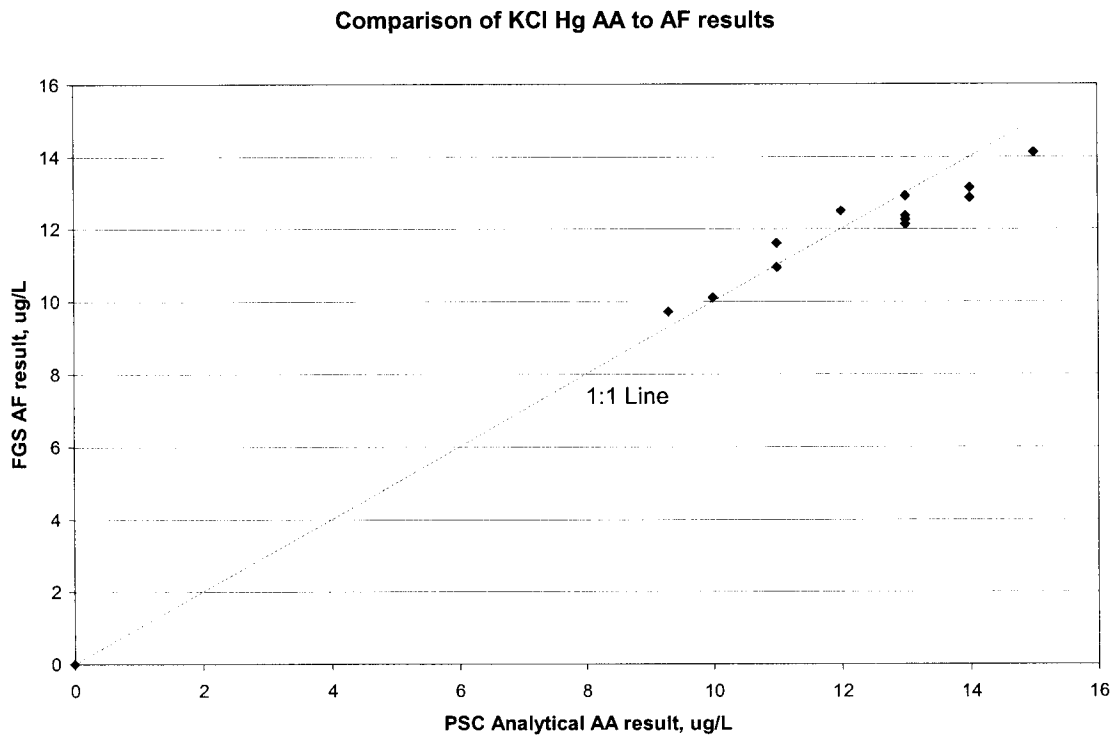
	all results in ug/dscm						
Wagner 3 Low Load	PM Hg	Hg +2	Hg 0	Total	% Oxidized	% Elemental	% Particle
Run 1	0.01	5.62	0.17	5.8	97%	3%	0.2%
Run 2	0.01	5.98	0.21	6.2	96%	3%	0.2%
Run 3	0.01	6.61	0.18	6.8	97%	3%	0.1%
Average	0.01	6.1	0.2	6.3	97%	3%	0.2%

	all results in ug/dscm						
Wagner 3 High Load	PM Hg	Hg +2	Hg 0	Total	% Oxidized	% Elemental	% Particle
Run 1	0.03	7.61	0.29	7.9	96%	4%	0.4%
Run 2	0.02	6.65	0.31	7.0	95%	4%	0.3%
Run 3	0.02	6.58	0.28	6.9	96%	4%	0.3%
Average	0.02	6.9	0.3	7.3	96%	4%	0.3%

Table E-9. Comparison Between AA and AF Analysis of Ontario Hydro KCl Impinger Solutions from Campaign Two.

KCl solution analyses Sample ID	PSC Analytical AA ug/L	AF ug/L	FGS AF ng/L	
	0	0		
R03090543-01A	12	12.5	12501	BS1
R03090543-02A	13	12.9	12913	BS1
R03090543-03A	14	13.1	13141	BS1
R03090543-04A-Blank	<0.05ug / 100 mL	0.0	2	BS1
R03090544-01A-Blank	<0.05ug / 110 mL	0.0	5	BS 2
R03090544-02A	15	14.1	14123	BS 2
R03090544-03A	11	11.6	11599	BS 2
R03090544-04A	10	10.1	10100	BS 2
R03090545-01A	13	12.1	12130	HAW 3
R03090545-02A	13	12.3	12262	HAW 3
R03090545-03A	14	12.9	12866	HAW 3
R03090545-04A	13	12.4	12370	HAW 3
R03090545-05A	11	10.9	10940	HAW 3
R03090545-06A	9.3	9.7	9722	HAW 3
R03090545-07A-Blank	<0.05ug / 110 mL	0.0	3	
R03090545-08A-Blank	<0.05ug / 110 mL	0.0	5	
R03090543-01A-AD			12555	Duplicate
R03090543-02A-AD			11861	Duplicate
R03090543-01A-AS+23723.67 ng/L	100% recovery		109.1% rec	Spike
R03090543-02A-AS+23448.64 ng/L	97% recovery		108.4% rec	Spike

Figure E.3. Chart of Comparison Between AA and AF Analysis of Ontario Hydro KCl Impinger Solutions from Campaign Two.



Campaign Two

Test ID	Trap ID	Start Date/Time(EST)	End Date/Time(EST)	Average Duct Temp °F	Average Gas Meter Temp °F	Average Pbar in. Hg	Final Volume liters	Volume Temp/Pres Corrected std liters	Total Carbon Trap				
									Trap A ng Hg	Trap A Recheck	Trap B ng Hg	Trap Blank ng Hg	Total Blank Corrected ng Hg
CPSG-1	S211	9/17/03 9:05	9/17/03 10:59	338.2	77.7	29.83	26.0	25.4	143.08	153.50	27.09	0.066	175.32
	13			338.2	84.2	29.83	23.1	22.4					
CPSG-2	S212	9/17/03 12:10	9/17/03 14:00	355.8	81.9	29.87	24.0	23.4	132.44		27.80	0.057	160.17
	12			355.8	92.5	29.87	20.6	19.7					
CPSG-3	S213	9/17/03 15:20	9/17/03 17:05	356.7	83.5	29.87	21.3	20.6	0.22		27.17	0.000	27.33
	5			356.7	94.3	29.87	17.7	16.8					
CPSG-4	S214	9/17/03 19:15	9/18/03 18:50	340.3	83.6	29.87	174.2	168.9	850.95		57.14	0.000	908.03
	14			340.3	94.4	29.87	185.1	176.0					
CPSG-5													
	15	9/21/03 7:25	9/21/03 16:05	330.7	92.2	29.84	140.5	134.0					
CPSG-6	L187	9/21/03 17:00	9/26/03 10:54	330.2	82.0	29.90	1422.4	1383.5					
CPSG-7	S2018	9/30/03 11:20	10/1/03 7:44	328.9	70.8	29.96	563.1	560.9	2063.89		7.87		2071.70
	11			328.9	80.5	29.96	371.8	363.7					
CPSG-8	S215	10/2/03 11:53	10/3/03 8:34	270.8	59.8	29.86	751.1	761.6	3375.47		202.02		3577.43
	2			270.8	69.9	29.86	521.0	518.0					
CPSG-9	S216	10/3/03 9:22	10/3/03 10:20	315.8	54.7	30.01	32.0	32.9	236.59		0.31		236.85
	1			315.8	63.4	30.01	21.5	21.7					
CPSG-10	S217	10/3/03 11:05	10/3/03 11:50	320.4	57.8	30.01	38.1	39.0	275.01		0.44		275.39
	6			320.4	65.8	30.01	27.4	27.6					
CPSG-0	S220	9/15/03 15:30	9/15/03 18:30										0.21
													1.20

npaign Tw		Speciated Carbon Traps										
Test ID	Corrected Conc ug/dsm^3	Particulate Hg ng Hg	Hg^0 A Trap ng Hg	Hg^0 B Trap ng Hg	Hg^{++} A Trap ng Hg	Hg^{++} B Trap ng Hg	Hg^0 Blanks ng Hg	Hg^{++} Blanks ng Hg	Total Corrected Particulate Hg ug/dsm^3	Total Correct Hg^0 ug/dsm^3	Total Corrected Hg^{++} ug/dsm^3	Total Corrected Hg ug/dsm^3
CPSG-1	6.90				7.21							
		0.037	0.50	0.08	6.75	0.19	0.101	0.0929	0.0017	0.0166	0.3149	0.33
CPSG-2	6.85											
		0.261	0.12	0.25	212.99	0.12	0.123	0.0565	0.0133	0.0085	10.8372	10.86
CPSG-3	1.32											
		0.143	0.20	0.07	0.17	0.00	0.105	0.0853	0.0085	0.0037	0.0027	0.01
CPSG-4	5.37		32.64									
		0.048	31.20	0.10	544.87	52.75	0.087	0.0117	0.0003	0.1808	3.3952	3.58
CPSG-5												
		0.147	0.65	0.05	271.25	2.39			0.0011	0.0037	2.0418	2.05
CPSG-6												
CPSG-7	3.69											
		0.165	1168.38	22.44	138.57	19.93			0.0005	3.2739	0.4355	3.71
CPSG-8	4.70											
		0.009	1353.59	6.82	342.80	158.80			0.0000	2.6259	0.9681	3.59
CPSG-9	7.20											
		0.000	1.12	0.08	0.53	0.13			0.0000	0.0457	0.0250	0.07
CPSG-10	7.06											
		0.011	5.05	0.08	15.66	0.54			0.0004	0.1780	0.5817	0.76
CPSG-0												

APPENDIX F

ADA-ES REPORT ON MERCURY SEMI-CONTINUOUS EMISSIONS MONITORING AT CRANE UNIT 1

Mercury Testing at C.P. Crane Unit 1

March 18 – 24, 2003 **DRAFT**

Prepared For:
Emission Strategies, Inc.
Severna Park, Maryland

Prepared by:

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May 31, 2003

Executive Summary

On December 14th 2000, EPA announced that it would regulate mercury emissions from coal-fired boilers under Title III of the Clean Air Act Amendments of 1990. There is limited information available on the capability of existing pollution control technologies for mercury control. Constellation Power Source Generation (Constellation) tested six coal-fired utility boilers to better understand their mercury emissions and the potential applicability of control technologies. The Maryland Department of Natural Resources (MDNR) Power Plant Research Program (PPRP) participated in this program by funding portions of the mercury testing, and providing technical analysis of the results. Emission Strategies, Inc. provided coordination among the various participants, test crews, and laboratories; and will prepare the final report for the overall program. (2)

As part of the mercury characterization effort, Emission Strategies subcontracted to ADA Environmental Solutions (ADA-ES) to measure the mercury concentration and speciation on Unit 1 of the C.P. Crane Station using a semi-continuous emissions monitor (S-CEM). This report presents only the results from of the ADA-ES portion of the program.

- A summary of ADA-ES results is shown in Table ES-1. The data collected suggest that little vapor-phase mercury is captured with the Unit 1 fabric filter.
- During periods of high load following periods of low load and lower temperatures, the vapor-phase mercury at the outlet was higher than the inlet, indicating thermal desorption of mercury from the collected ash.
- The mercury at the inlet to the fabric filter was nominally 90% oxidized and increased to nominally 99% at the outlet.
- Large spikes in the inlet mercury concentration were observed. These appeared to be related to rapid changes in boiler operation. The spikes did not appear to affect the outlet mercury concentration.

Detailed discussions and presentations of all test data are provided in the report.

Table ES-1. Summary of Results from C.P. Crane

Location	Total Hg ($\mu g/Nm^3$)	Elemental Hg ($\mu g/Nm^3$)
Inlet	0.2 to 10	0.3 to 0.5
Outlet	0.2 to 13	<0.1

Table of Contents

1.0 Introduction

Mercury from combustion sources is recognized as a major concern to the nation's air quality. The U.S. Environmental Protection Agency (EPA) submitted a Mercury Study Report to Congress that states that 52 of the 158 tons of anthropogenic Hg emissions in the United States are from coal-fired utility boilers (1). On December 14th 2000, EPA announced that it would regulate mercury emissions from coal-fired boilers under Title III of the Clean Air Act Amendments of 1990. EPA plans to issue final regulations by December 15th 2004 and is expected to require compliance by December 2007.

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1.1 Purpose of Test

The purpose of the ADA-ES portion of this test program was to continuously measure the mercury concentration and speciation at the inlet and outlet of the Crane Unit 1 fabric filter over a 7-day test period. To accomplish this, a mercury S-CEM was used during this program to provide near real-time feedback of mercury concentration and speciation at each sampling location.

1.2 Facility Description

Crane Units 1 & 2 are identical Babcock & Wilcox, opposed-wall-fired, wet-bottom, cyclone-burner boilers with a capacity of 200 MWe each. There are four cyclones per unit that burn Eastern Bituminous coal with a sulfur content of about 1.9 percent and mercury content ranging from 0.1 to 0.3 µg/g. These units utilize the overfire air (OFA) portion of a retrofitted gas reburn system for NO_x control during the peak ozone season. The OFA system was used periodically during testing to determine its effect on gas phase mercury concentration.

Each unit is equipped with a GEESI reverse-gas style fabric filter with a design air-to-cloth ratio of 1.96 (ft^2/1000 acfm). There are ten modules in each fabric filter with 540 bags per module. Sonic horns are used to augment the reverse-air cleaning. Flue gas is exhausted to the atmosphere through a 384 foot stack.

1.3 Key Personnel

The Key Personnel coordinating efforts during ADA-ES testing at Crane are identified in Table 1-1.

Contact Name	Company	Telephone Number	Email Address
Stephen J. Matousek -	CPSG	Office: 410-787-5275 Cell: 410-802-8079	Stephen.J.Matousek@constellation.com
Ed Much	CPSG	Office: (410) 787-9073 Cell: (410) 530-4913	edwin.much@constellation.com
Sheila Glesmann	Emission Strategies	Office: (410) 544-5292 Cell: (443 310-7169	sheila.glesmann@verizon.net
Sharon Sjostrom	ADA-ES	Office: (303) 734-1727 Cell: (303) 919-8538	sharons@adaes.com
Gerald Amhrein	ADA-ES	Office: (303) 734-1727 Cell: (303) 921-8138	jerrya@adaes.com

C.P. Crane
Lou Gable at storeroom (682-9737)
C. P. Crane
1001 Carroll Island Rd.
Baltimore, MD 21220

2.0 Plant Description and Test Locations

2.1 C.P.Crane Unit 1

Unit 1 burns a bituminous coal in a B&W opposed-fired cyclone boiler with a nameplate capacity of 200 MW. A fabric filter is used for particulate control. Operating parameters for Unit 1 are summarized in Table 1.

Table 1. Plant Yates Unit 1 Operation

Parameter	Description
Boiler	
Type	B&W opposed-fired
Burner Type	Cyclone
Equivalent Mwe	200
Coal	
Coal Type	Bituminous
Particulate Control	
Type	Fabric Filter
Manufacturer	GEESI
Design	Reverse Gas with Sonic Horns
Air-to-cloth Ratio (ft/min)	1.96

Mercury measurements were made both upstream and downstream of the fabric filter. Figure 1 is a schematic of Unit 1 showing the sampling locations. Coal and ash samples were not collected by ADA-ES but were collected as part of the overall program.

The inlet sampling location, shown in Figure 2, was a single horizontal sampling port located at the inlet of the unit 1 fabric filter. The port was approximately five feet below the top of the duct and was the second from the top port in a row of seven vertical ports. The extraction probe was made up of three sections and extended eight feet into the duct from the flange. It could be shortened by removing sections of the probe.

The outlet sampling location, shown in Figure 3, was a single horizontal port located at the outlet of the fabric filter upstream of the ID fans. The port was the middle of three vertical ports at this location. The extraction probe extended eight feet into the duct from the flange. The length of the probe could be adjusted by removing or adding sections.

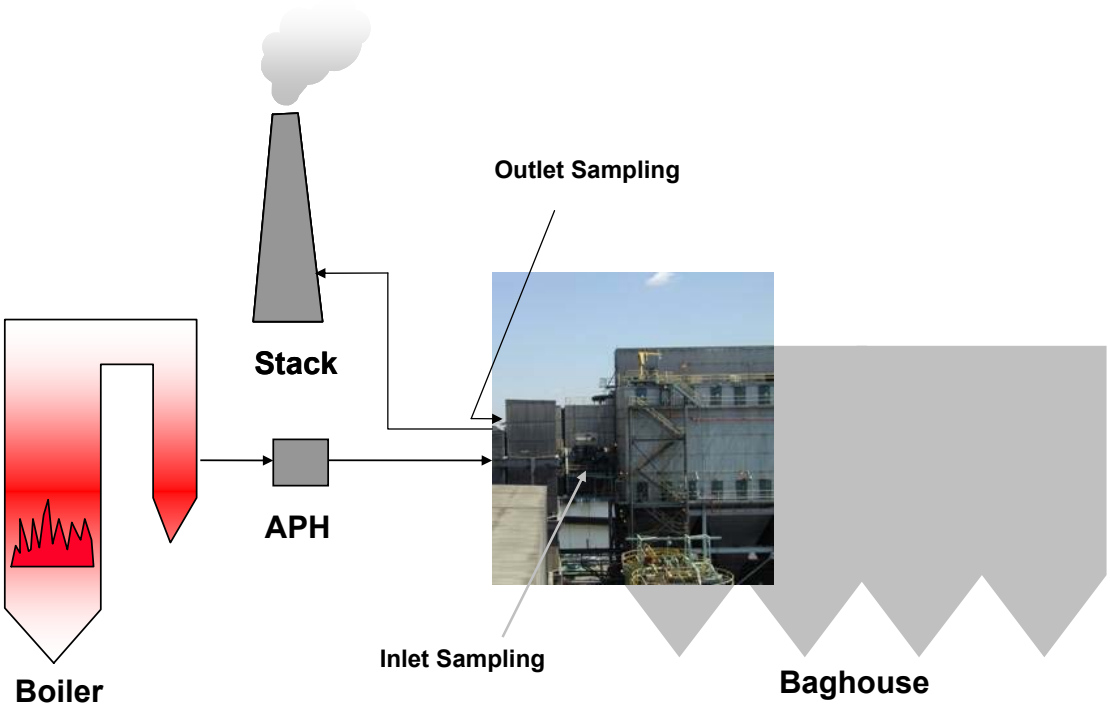

Figure 1. Mercury sampling locations at C.P. Crane Unit 1.

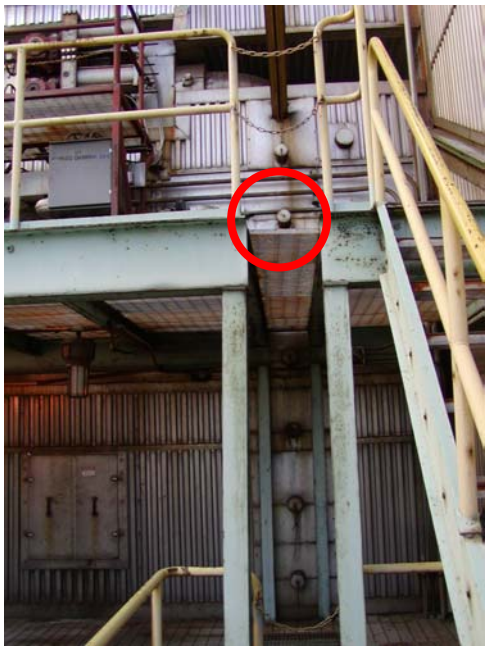

Figure 2. Inlet Test Port

Figure 3. Outlet Test Port

3.0 Summary and Discussion of Results

3.1 Presentation of Results

The program objective was to continuously measure vapor phase mercury concentration and periodically measure speciation at the inlet and outlet of the C.P. Crane Unit 1 fabric filter during a 7-day period. To achieve this objective, ADA-ES used a single mercury S-CEM that alternately sampled gas at the inlet and outlet of the fabric filter. The S-CEM was capable of measuring either the total or elemental mercury concentration at each location.

The results from the S-CEM were later analyzed along with various plant operating data to develop short-term mercury concentration trends and to see if variables such as pressure drop across the fabric filter, gas temperature, boiler load, or other plant operating characteristics affected these trends.

The mercury S-CEM at Crane operated continuously from April 18 through April 25. Time trends of the mercury measurements, duct temperature at the sampling locations, and boiler load are shown in Figure 4. The mercury removal shown in Figure 4 is calculated using the mercury concentrations corrected to 3% oxygen to account for any change in mercury concentration resulting from air in leakage between the inlet and outlet sampling locations.

3.2 Summary of Results

The data collected at Crane, Unit 1 suggests that the change in vapor-phase mercury across the fabric filter (removal efficiency) is variable and, at times, the vapor-phase concentration at the outlet was higher than measured at the inlet, as shown in Figure 4. This observation could be caused by stratification in the mercury concentration (for example, if the mercury concentration at the inlet extraction location was below the average across the duct), or it could be caused by high mercury adsorption onto the fly ash prior to reaching the inlet extraction location.

Table 2 presents average mercury concentrations as measured by the S-CEMs at the inlet and outlet to the baghouse during the Ontario Hydro measurements. This table shows both a variation in total vapor phase mercury at the inlet (ranged from 0.31 to 4.92 $\mu g/dNm^3$) and removal efficiency (6 to 80%). These data illustrate the dynamic nature of mercury in flue gas as it flows through the system. Trends observed during this test included:

- The inlet and outlet mercury concentrations tracked fairly closely except for periods immediately following a large increase in boiler load (e. 125 to 200 MW) when mercury levels increased at both locations, but the outlet was often higher than the inlet. Except for these transition periods, it is likely the reactive vapor-phase mercury is adsorbed onto the fly ash prior to reaching the inlet measurement location and very little additional reduction in vapor-phase mercury takes place on the bags. During these transitions, several key variables are changing that could cause this phenomena.
    - Temperature is one of the variables that can cause variations in mercury behavior because it determines when and the quantity of mercury a carbon/fly ash based sorbent can adsorb. The S-CEM measurements suggest that vapor phase mercury is adsorbed by the fly ash while in-flight at fairly significant levels. At lower boiler load conditions, temperatures are typically lower which improves the ability of fly ash to collect mercury, especially oxidized mercury (3). However, when temperature increases, such as often happens when the boiler load increases, the capacity of mercury that the fly ash (sorbent) can hold decreases. Thus, under certain conditions the mercury can be desorbed from the fly ash.

The outlet may be higher than the inlet for several hours as mercury slowly desorbs off the fly ash collected in the baghouse.

- Figure 4 shows that mercury concentration varies from 0.2 to 10 μg/dNm^3 at the inlet. This is probably a combination of differences in in-flight adsorption onto fly ash, partially explained above, and changes in coal and combustion conditions. For example, changes in amount and characteristics of the LOI carbon can cause differences in mercury concentration and removal efficiencies. This may have been occurring when inlet and outlet mercury levels diverged on April 22 and 23.

- In general there was very little mercury removal across the baghouse. This goes against conventional theory that shows, in most cases, very good removal across the baghouse because of the enhanced gas-particle interaction on the dustcake. However, there are a few sites where significant in-flight adsorption of vapor-phase mercury onto fly ash has been documented. This is more likely at sites with higher percentages of oxidized mercury, sufficient LOI carbon in the fly ash and temperatures less than 300°F. At Crane Station, it is possible that the fly ash has already reached its capacity for mercury with the mercury adsorbed while in-flight. Thus, when it reaches the baghouse, no additional mercury can be adsorbed.

- The fraction of elemental mercury is low at both extraction locations, as shown in Figures 5 and 6. At the inlet, the measurements indicate 90% of the mercury is in the oxidized form. At the outlet, 99% is in the oxidized form. The higher fraction of oxidized mercury at the outlet suggests that the mercury may be interacting with the fly ash and being further oxidized.

  - Researchers have documented that mercury is typically desorbed from sorbents in the oxidized form.

- Another interesting observation noted during testing was the periodic spikes in the inlet mercury concentration (4/20 – 4/22). These typically corresponded to spikes in both the boiler oxygen and the oxygen measured at the inlet extraction location (see Figure 7). Some of the oxygen spikes can correspond to momentary losses in coal feed to one of the mills and fluctuations in the cyclone air flow. The behavior of the mercury suggests that it is adsorbed on fly ash prior to the inlet extraction location and a portion of the collected mercury can be readily desorbed. No mercury spikes were observed at the outlet extraction location.

Table 2. Average Vapor-Phase Mercury Concentrations Measured by the SCEM During OH Runs

OH Run	Start Time	Stop Time	Inlet Total Vapor Hg μg/dNm^3 (@ 3% O_2)	Outlet Total Vapor Hg μg/dNm^3 (@ 3% O_2)	Inlet Elemental Hg μg/dNm^3 (@ 3% O_2)	Total Vapor Hg Removal (%)
Run 1	4/23/2003 12:25	4/23/2003 14:46	4.92	1.77	0.43	64
Run 2	4/23/2003 15:55	4/23/2003 18:15	4.49	0.90		80
Run 3	4/24/2003 8:50	4/24/2003 11:06	0.31	0.29		6

On the morning of April 23, the inlet extraction probe was shortened from 8-feet to 6-feet in an effort to determine if mercury stratification was the cause of the mercury concentrations measured at the inlet periodically exceeding the measurements at the outlet. In Figure 4, an interruption in the inlet mercury measurement can be noted from 9:00 to 11:45 am. Prior to 9:00 am, the probe was 8-feet long. After 11:45, the probe was 6-feet long. No change in mercury concentration or extraction temperature at the inlet was noted following the change in probe length.

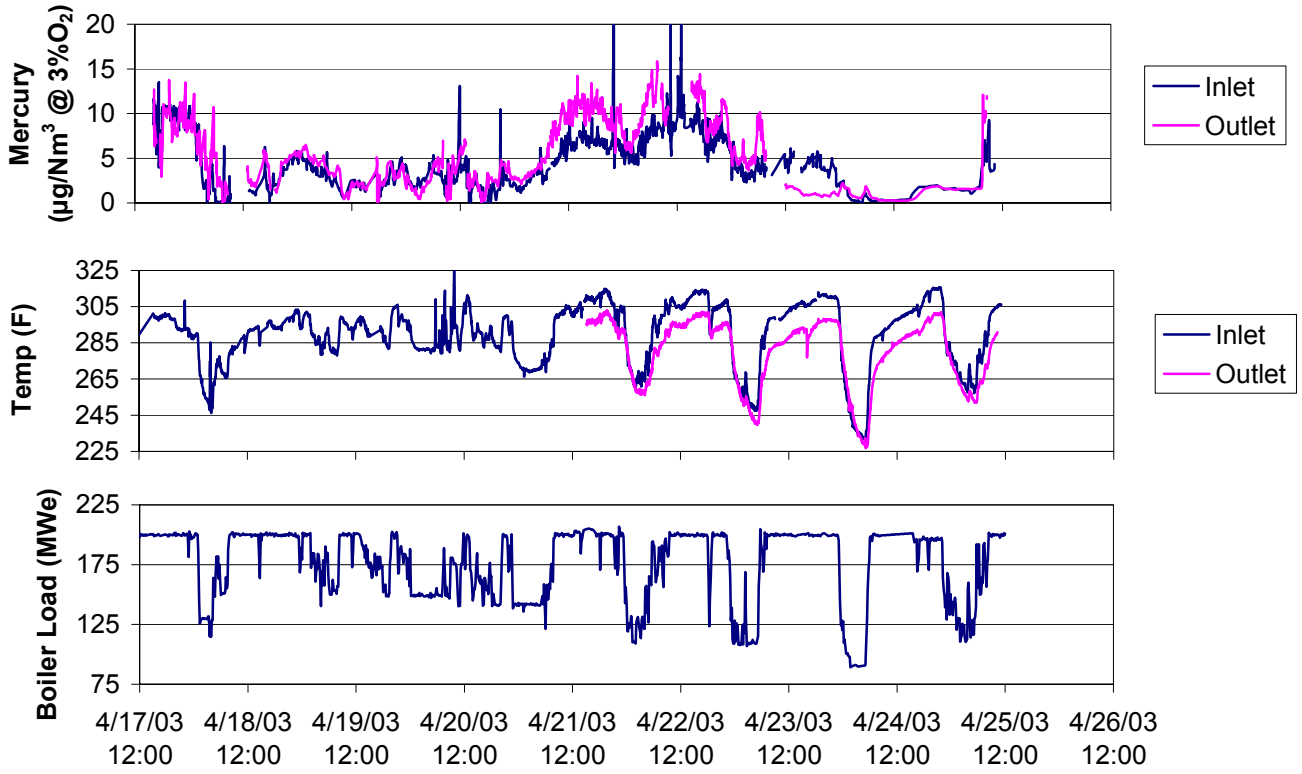

Figure 4. Variations in boiler load, temperature, and mercury concentrations at the inlet and outlet of the fabric filter at Crane Unit 1.

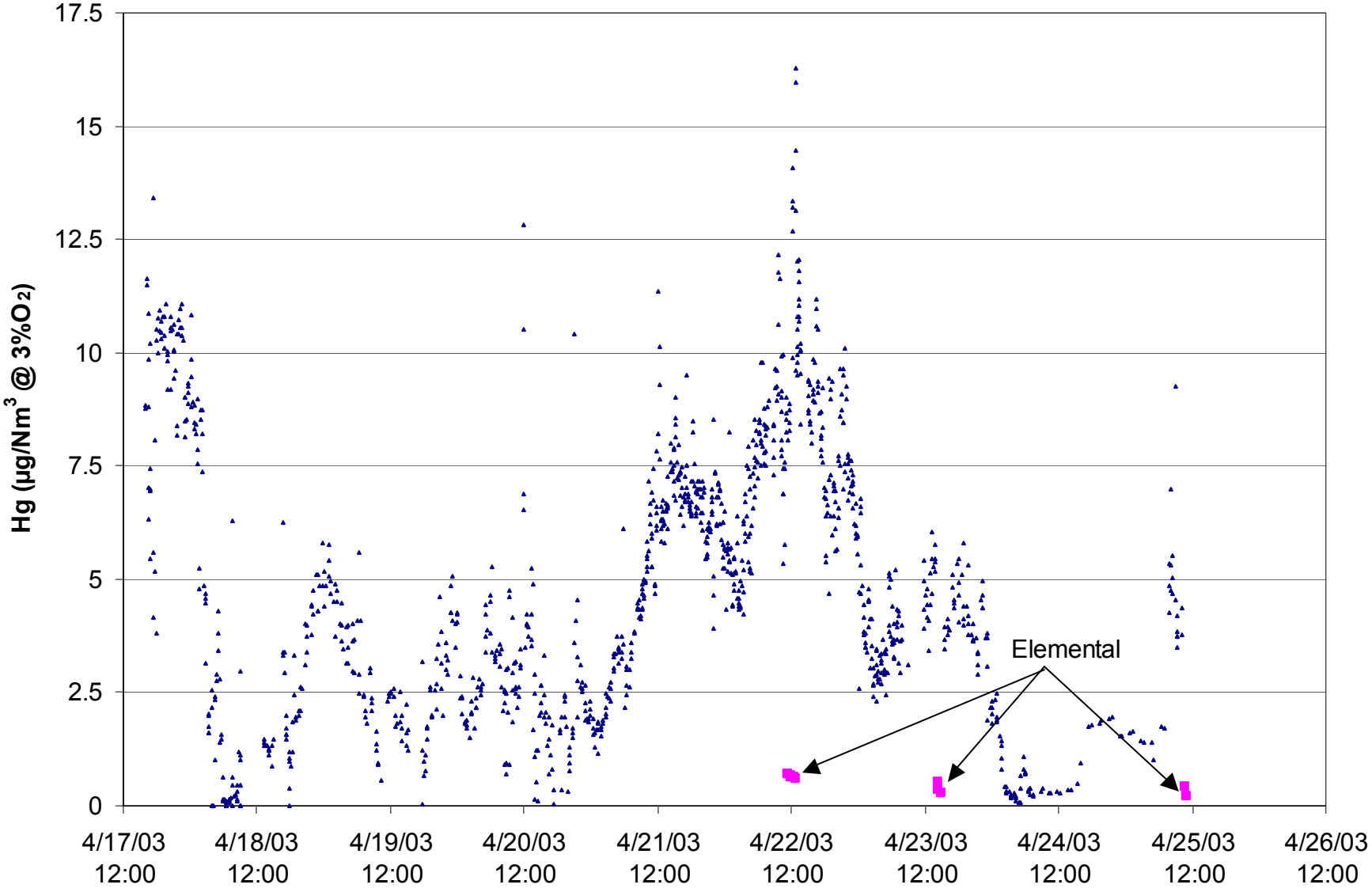

Figure 5. Inlet vapor-phase mercury concentration measured at Crane Unit 1

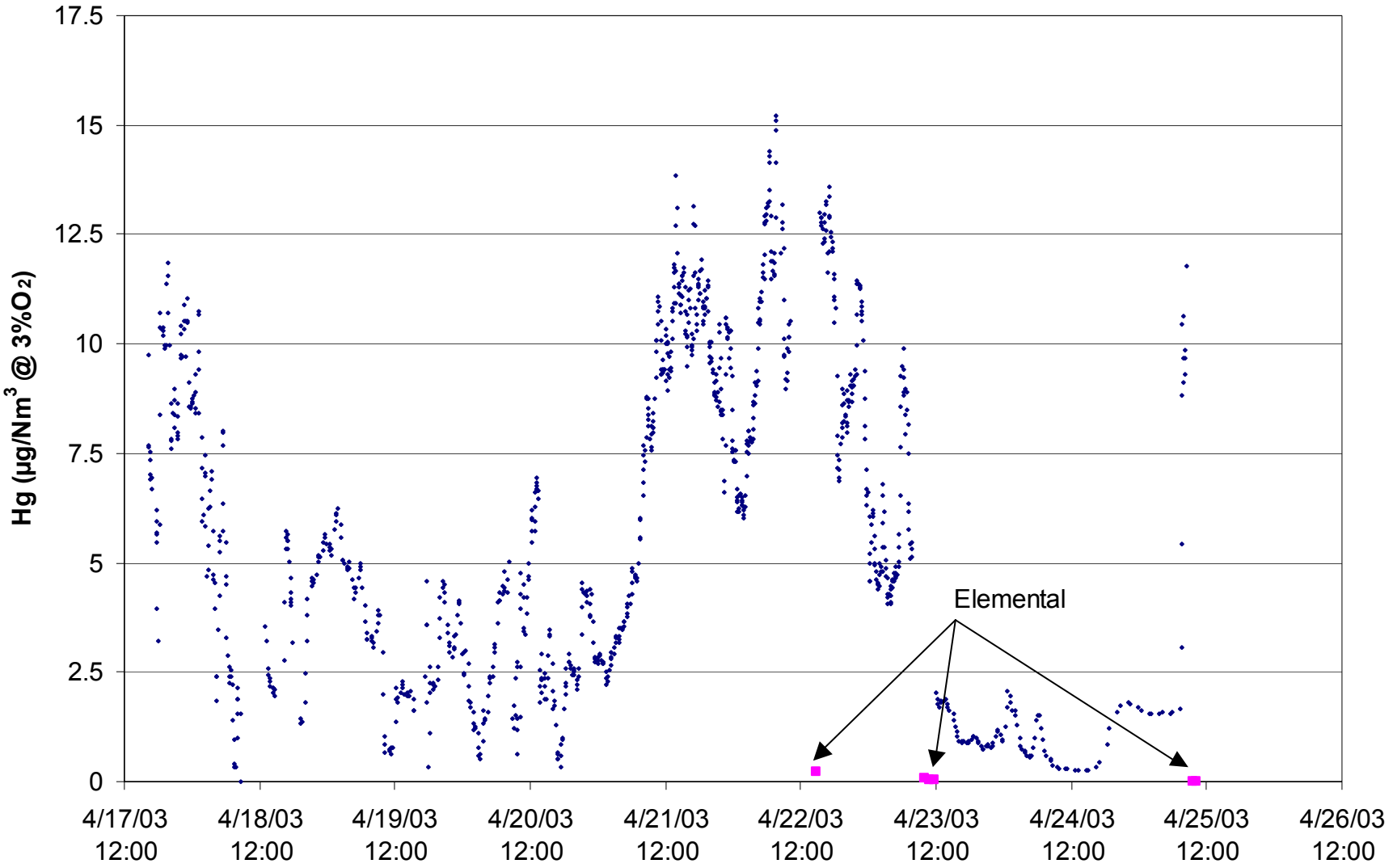

Figure 6. Outlet vapor-phase mercury concentration measured at Crane Unit 1

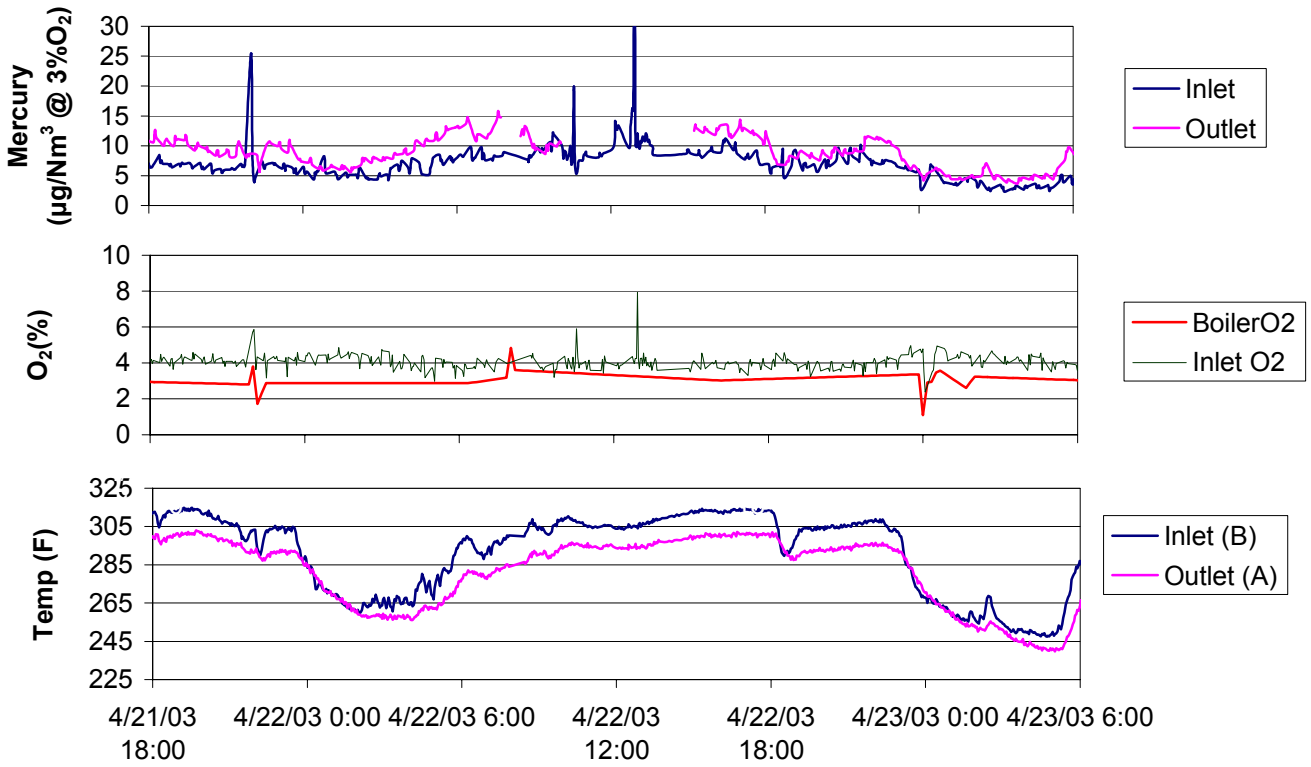

Figure 7. Comparison of oxygen spikes and inlet mercury spikes

4.0 Description of Mercury Monitors and Sampling Procedures

4.1 Description of Mercury Monitor

A semi-continuous mercury emissions monitor (S-CEM) was used during this program to provide near real-time measurement of mercury at the inlet and outlet of the fabric filter during one week of typical plant operation. The analyzer used for these tests consisted of a cold vapor atomic absorption spectrometer (CVAAS) coupled with a gold amalgamation system (Au-CVAAS). The system is calibrated using vapor phase elemental mercury. A schematic of the system is shown in Figure 5. The S-CEM was configured to automatically switch between two channels and so could measure either the total or elemental vapor phase mercury at the inlet and outlet of the fabric filter. A photograph of the S-CEM installed at Crane is shown in Figure 6.

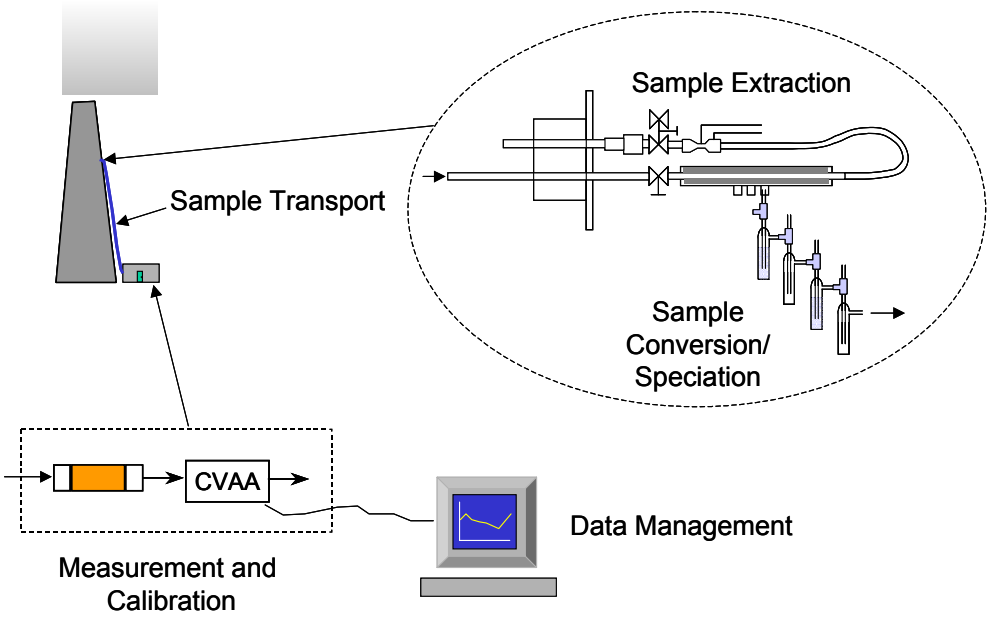

Figure 5. Schematic of the Mercury Measurement System.

Figure 6. Photograph of ADA-ES mercury S-CEM during installation at C.P. Crane Unit 1.

Although it is very difficult to transport non-elemental mercury in sampling lines, elemental mercury can be transported without significant problems. Since the Au-CVAAS measures mercury by using the distinct lines of the UV absorption characteristic of Hg^0, the non-elemental fraction is either converted to elemental mercury (for total mercury measurement) or removed (for measurement of the elemental fraction) near the sample extraction point. This minimizes losses in the sampling lines.

For total vapor phase mercury measurements, all non-elemental vapor phase mercury in the flue gas must be converted to elemental mercury. A reduction solution of stannous chloride in hydrochloric acid is used to convert Hg^{2+} to Hg^0. To measure speciated mercury, an impinger of potassium chloride (KCl) solution, mixed as prescribed by the draft Ontario Hydro Method, is used to capture oxidized mercury so that only the elemental fraction of the vapor phase mercury passes to the analyzer. Oxidized mercury can be calculated as the difference between the total mercury and the elemental mercury. The impinger solutions are continuously refreshed to assure adequate exposure of the gas to active chemicals.

4.2 Sampling Procedures and QA/QC

The analyzer sampling time is set to collect nominally 20 ng of mercury per sampling cycle. The noise level of the analyzer operating at a field site is approximately 1 ng, thus collecting 20 ng provides a signal to noise ratio of 20.

The analyzer is calibrated daily for mercury. The mass flow controller, oxygen cell, and temperature transmitters were calibrated before shipping the system to the site. Mercury calibration is achieved by injecting precise volumes of air saturated with elemental mercury vapor into the analyzer upstream of the gold trap. The mercury vapor is drawn from a vial containing liquid elemental mercury. Mercury concentration is calculated from a well-known correlation with barometric pressure and temperature. Vial temperature is measured with a precision thermometer. Calibration of the mass flow controller is periodically checked with a gas flow meter. Mercury vapor was also spiked upstream of each set of conversion impingers as part of the daily calibration routine to insure that gas preconditioning system was not removing mercury.

Documentation of analyzer calibrations, along with any system maintenance or changes, are recorded in a project notebook. A calibration file for the other instrumentation, which contains manufacturers' certification of calibration, is maintained by ADA-ES.

Data verification of computer calculations is conducted manually on a periodic basis. Any data collected during periods of suspected operational inconsistencies is rejected as questionable data.

References

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2 Glesmann, Sheila. "Test Plan for Mercury measurements at Constellation Power Source Generation's Coal-Fired Units", Emission Strategies, March 2003.

3 Sjostrom, S., Bustard, J., M. Durham, and R. Chang (2002). "Mercury Removal Trends and Options for Coal-Fired Power Plants with Full-Scale ESPs and Fabric Filters," Nineteenth Annual International Pittsburgh Coal Conference, Pittsburgh, PA, September 23-27.